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EXPERIMENT STATION RECORD.

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No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The chemistry of colloids (*New York: John Wiley & Sons, Inc., 1917, pp. 248, figs. 39*).—Part 1 of this volume, by R. Zsigmondy, consists of a translation, by E. B. Spear, of the German edition (*E. S. R.*, 28, p. 407). In part 2, by E. B. Spear, certain industrial applications of colloidal chemistry are discussed, including smoke, rubber, tanning, milk, colloidal graphite, and clays. The book closes with a chapter on Colloids in Sanitation, by J. F. Norton, in which purification of wastes and sewage and the mechanism of disinfection are discussed.

Outline of colloid chemistry, I-III. W. D. BANCROFT (*Jour. Franklin Inst.*, 1918, *Nov. 1*, pp. 29-57; 2, pp. 199-230; 3, pp. 373-387).—Part 1 of this book discusses adsorption of gases, liquids, and solids, including the following topics: Catalytic action of solids on gases, adsorption of gases and vapors by solids and by liquids, adsorption of liquids by solids and by liquids, and adsorption of solids by solids and by liquids. Phenomena illustrating each class of adsorption are noted.

Part 2 discusses adsorption from solution and coalescence under the following heads: Adsorption from solution by solid, the adsorption isotherm, normal adsorption, negative adsorption, reversibility of equilibrium, specificity of adsorption, adsorption of several solutes, adsorption from solution by liquid, adsorption and surface tension, Brownian movements, coalescence of liquids, coalescence of solids, and plasticity.

Part 3 discusses the preparation of colloidal solutions, including types of precipitates, theory of peptization, condensation methods, and dispersion methods. Under condensation methods there are two subdivisions, in which stability is due chiefly to the presence of strongly adsorbed substances or partly to the low concentration of agglomerating agents. Under dispersion methods the subdivisions are disintegration by removing an agglomerating agent, by adding a peptizing agent, by mechanical methods, by electrical methods, and by electrochemical methods.

On the swelling of gelatin in polybasic acids and their salts. M. H. FISCHER and MARIAN O. HOOKER (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 1, pp. 272-292).

Gr. II.—Experiments are described showing the amount of water absorbed by gelatin discs immersed in different concentrations of the primary, binary, or ternary salts of phosphoric, citric, and carbonic acids. The swelling varied directly with the salt but with its concentration.

In further experiments on the absorption of water from phosphate, citrate, and carbonate mixtures varying from the pure acid through the mono-, di-, and tri-sodium salts to pure sodium hydroxid, the results yielded a V-shaped or U-shaped curve showing a progressive increase in water absorption to the left or to the right as the acid or alkali content of the mixture was increased.

"These findings are held to be applicable to the problem of water absorption by protoplasm and to sustain the old contention that even in the presence of buffer salts there is an increase in water absorption (increased turgor or edema) with every increase in the acid (or alkali) content of the protein colloids found in the involved cell, organ, or organism."

On the swelling of fibrin in polybasic acids and their salts, M. H. FISCHER and M. BENZINGER (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 1, pp. 292-303, fig. 6).—The experiments noted above were repeated using a different protein, fibrin. The results showed a difference in the minimal swelling point for the two proteins, a point which should be kept in mind in a study of biological material representing a mixture of proteins.

It is the opinion of the authors that the results of these studies emphasize the importance of acids, alkalis, and salts in determining the amount of water absorbed by protoplasm under physiological and pathological conditions. "Through the accumulation or production in protoplasm of an abnormally great amount of acid (or of alkali), we are thus enabled to explain the mechanism by which the abnormally high hydrations of living cells are brought about, such as are observed in the excessive turgors of plant tissues and in the edemas which involve the animal body."

On the liquefaction or "solution" of gelatin in polybasic acids and their salts, M. H. FISCHER and W. D. COFFMAN (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 1, pp. 303-312, figs. 3).—Experimental data are given to prove that the swelling of a protein colloid and its liquefaction or solution are totally different processes. "There is a progressive increase in the tendency of gelatin to go into solution in mixtures of the salts of polybasic acids as the amount of acid or alkali in these mixtures is increased from a given low point."

The article closes with a discussion of the bearing of the experiments upon the changes observable in living cells subjected to direct or indirect acid intoxication and upon the problems of digestion and autolysis.

On the diastatic decomposition of inulin in chicory root, J. WOLFF and R. GESLIN (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 19, pp. 651-654).—Continuing the observations on inulin previously noted (E. S. R., 36, p. 127), the authors have examined the progressive changes in the inulin of chicory root on standing and conclude that the decomposition of the inulin is a continuous process under the influence of diastatic agents until hexoses are reached. They have chosen the name "inulides" for the intermediary products and point out the resemblance between the inulides and the different dextrans. Three groups of inulides have been identified corresponding to the action of three different yeasts.

The hydrolyzing action of chicory juice on the inulides contained in the juice is due to a diastase seemingly identical with the sucrase of yeast, as the same results have been obtained by treating either inulides or a solution of sucrose with yeast or with fresh chicory juice. Both of these hydrolyzing agents are without action on pure inulin.

The influence of glycerin on the activity of invertase, É. BOURQUELOT (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 17, pp. 567-569; *Jour. Pharm. et Chim.*, 7. ser., 17 (1918), Nos. 3, pp. 65-71; 4, pp. 113-117).—Experimental data are given proving that the activity of invertase is weakened by glycerin.

whether this effect is due to a progressive destruction of the ferment or to a particular inhibiting action of the glycerin has not yet been determined.

Toxic and antagonistic effects of salts on wine yeast (*Saccharomyces ellipsoideus*). S. K. MITRA (*Univ. Cal. Publ. Agr. Sci.*, 3 (1917), No. 5, pp. 63-101, figs. 14).—In the investigations reported the toxic effects of single salts and the antagonistic effects of combinations of salts on the growth of yeast were studied. The yeast *S. ellipsoideus* was selected on account of its universal use in wine making. The salts tested were the chlorides of potassium, magnesium, calcium, and sodium, selected because their metallic ions are those most abundant in the ash of grape juice. The nutrient solution was prepared from crystallized cane sugar, phosphoric acid, and ammonia. To 100 cc. of the solution was added the salt or combination of salts under investigation in various strengths of molecular concentration from 0.001 to 2.2M. After inoculation with 1 cc. of a pure culture of the yeast, the flasks were kept in an incubator at 25° C. The activity of the yeast was determined by the multiplication of the yeast at intervals of 48 hours for a period of 12 days.

The toxic effects of the single salts were as follows: (1) Each of the four single salts is more or less toxic to the yeast. At a certain concentration potassium chloride is the least toxic and sodium chloride the most. (2) The lower concentrations of each salt stimulate, the higher concentrations inhibit, the growth of yeast. The optimum concentrations for growth were found at 0.2M $MgCl_2$, 0.01M $CaCl_2$, and 0.001M $NaCl$. The lowest concentrations at which growth was inhibited were at 2.2M KCl , 1.2M $MgCl_2$, 0.7M $CaCl_2$, and 0.1M $NaCl$. (3) The results are quite different from those found by other investigators with either bacteria, the higher plants, or animals, yeast standing midway between plants and animals. (4) Toxicity is also shown by a decrease in the size of the yeast cell with higher concentrations of the salts.

The antagonistic effects of combinations of the different salts in pairs were found to be in the following order from highest to lowest: $MgCl_2$ v. $CaCl_2$, KCl v. $CaCl_2$, $MgCl_2$ v. $NaCl$, KCl v. $NaCl$, KCl v. $MgCl_2$, and $CaCl_2$ v. $NaCl$. Expressed in terms of valency of ions, it was found that divalent ions may antagonize monovalent and divalent ions, and that monovalent ions may antagonize divalent ions and to a slight extent monovalent ions. In general the antagonistic effect on yeast was found to be similar to the recorded work on higher plants, and animals.

The experimental data are given in tabular and graphical form and a bibliography of 38 references to the literature cited is appended.

A study of the water-soluble accessory growth-promoting substance in yeast. I. J. C. DRUMMOND (*Biochem. Jour.*, 11 (1917), Nos. 3-4, pp. 255-272, figs. 1).

The literature on the properties of the "antineuritic vitamin" and the yeast-promoting food accessory "water-soluble B" is reviewed, and investigations aiming at the isolation and identification of the latter substance are described. Experimental evidence is given demonstrating that certain of the properties possessed by both are very similar, thus supporting the view of McCollum and others that the two substances are identical. Attempts at isolating the water-soluble accessory in yeast were unsuccessful, but the failure was attributed by the author more to the adsorption of substances of this class in solution by precipitates than to their reputed instability.

Contributions to the biochemistry of pathogenic anaerobes.—II, The acid reduction of *Bacillus welchii* (*B. perfringens*) and *B. sporogenes* (Metchnikov). C. G. L. WOLF and S. V. TELFER (*Biochem. Jour.*, 11 (1917), No. 3-4, pp. 212-212, figs. 2).—This continues work previously noted (E. S. R., 38, p. 433).

In order to investigate the acid production of fermentations of *B. welchii* and *B. sporogenes*, a critical study was made of Dyer's method of separation of volatile fatty acids in a mixture (E. S. R., 37, p. 13). The method, while satisfactory in dealing with a mixture of two volatile acids, was unsatisfactory with a mixture of unknown acids, and the following modification was used in the present investigation:

A portion of the fermented liquid was distilled exhaustively to determine the total amount of volatile acids present and another portion distilled as a single acid mixture according to Dyer's method. This indicated the highest and lowest acids in the mixture. Fractionated portions of a series of separate steam distillations were then collected, the total amount of acid in the fractions calculated from the distilling rate of the mixture, and chemical tests applied to the concentrated distillates of the fractions. Finally, an artificial mixture of acids was prepared from a study of the data so obtained and its rate of distillation compared with that of the fermentation liquid. The authors state that the method is tedious in application and affords only approximate results, but is useful in giving important information regarding the acids produced by various organisms.

The results with *B. welchii* and *B. sporogenes* show that large quantities of volatile acids are produced, of which butyric acid is a constant component. In the action of *B. sporogenes* on milk, caproic and valeric acids are formed. Propionic acid was not detected, but its presence is not excluded. Phenylacetic acid is not present. Forty per cent of the total acid produced is nonvolatile. The nature of these acids has not yet been ascertained.

Contributions to the biochemistry of pathogenic anaerobes.—III. The effect of acids on the growth of *Bacillus welchii* (*B. perfringens*) and *B. sporogenes* (Metchnikoff), C. G. L. WOLF and J. E. G. HARRIS (*Biochem. Jour.*, 11 (1917), No. 3-4, pp. 213-245, figs. 8).—Investigations on the effect of acids on the growth of *B. perfringens* and *B. sporogenes* are reported, together with the results of an examination of the behavior of the acids used with nutrient media.

The addition of acids to liquids containing large amounts of buffering substances produces a complex effect on the true reaction of the media due partly to the type of acid and partly to the nature and content of the buffering substances in the mixture. With the less highly dissociated acids a point is soon reached where successive amounts of the acid affect the reaction but slightly.

The action of acids on the growth of the bacteria studied affects (1) the latent period of growth (the more highly acid the medium the greater the interval elapses before signs of growth are observed); (2) the final reaction at which growth ceases (with a given acid and varying initial concentrations, a series of reactions is obtained which can be represented by a curve which is individual for each acid); and (3) the total inhibition of growth (the fermentation of both organisms is inhibited by a rise of hydrogen ion concentration which may merely delay growth or may stop it entirely). The inhibitory effect of all acids is the same.

The authors conclude that the results of these investigations confirm the earlier views (E. S. R., 38, p. 483) that the treatment of gas gangrene infection by means of acid solutions, highly buffered, is worthy of trial.

Further observations on the influence of phenol and of cresylic acid on the concentration of antitoxic sera by the Banzhaf (1913) process. ANTON HOMER (*Biochem. Jour.*, 11 (1917), No. 3-4, pp. 277-282).—The author reports that the difficulties in the technique of the Banzhaf process for the concentration of antitoxic sera and the tendency of the end-products to become cloudy may be obviated by the addition of 2 per cent of sodium chlorid and fresh

0.35 per cent of cresylic acid to the plasma previous to the heating of the plasma-ammonium sulphate mixtures. The mixtures should be neither heated beyond 60° C. nor allowed to remain at this temperature for more than two or three minutes. Experimental data are given to show that the addition of cresylic acid increases the concentration of the sera and the percentage removal of the serum proteins.

See also previous notes (E. S. R., 37, pp. 376, 877).

A note on the use of indicators for the colorimetric determination of the hydrogen ion concentration of sera, ANNIE HOMER (*Biochem. Jour.*, 11 (1917), pp. 3-4, pp. 283-291).—Results of investigations on the accuracy of the determination of the hydrogen ion concentration of sera by the colorimetric method of Clark and Lubs (E. S. R., 37, p. 506) with the use of certain indicators are reported.

The author suggests that "in view of the personal error involved in the determination of color reactions with sera it is advisable that each worker using the colorimetric method should ascertain the degree of approximation of his own values to the true values determined by the electrical method."

The preparation of plant nucleic acids, G. CLARKE and S. B. SCHRYVER (*Biochem. Jour.*, 11 (1917), No. 3-4, pp. 319-324).—Methods are reported for the preparation of protein-free nucleic acid from plant tissues without peptic digestion by first boiling the material used with alcohol and then extracting with warm 10 per cent sodium chlorid solution. The nucleic acid is precipitated from the extract on the addition of hydrochloric acid.

Starch-containing material, such as wheat embryos obtained in the modern milling processes, should be fermented with diastase before extracting with sodium chlorid solution to avoid difficulties in filtering. Analyses are included of nucleic acid obtained by this method from yeast and from wheat embryos. The results agree closely with the formula $C_{10}H_{16}O_{22}N_{11}P$, suggested by Levene for plant nucleic acid (E. S. R., 22, p. 115).

The proteins of cow's milk, T. B. OSBORNE, A. J. WAKEMAN, ET AL. (*Jour. Biol. Chem.*, 33 (1918), No. 1, pp. 7-17).—A study of the proteins remaining in milk after the removal of casein is reported. The methods of separation and purification of the constituents are given in detail. Analyses of the purified lactalbumin and lactoglobulin gave the following composition:

Composition of purified lactalbumin and lactoglobulin.

Kind of protein.	Moisture.	Ash.	Ash and moisture free.				
			Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Phosphorus.
Lactalbumin.....	Per cent. 6.27	Per cent. 0.16	Per cent. 62.51	Per cent. 7.10	Per cent. 15.43	Per cent. 1.92	Per cent. Trace.
Lactoglobulin.....	8.55	2.12	51.88	6.96	15.44	.86	0.24

Special investigation of the phosphorus in the lactoglobulin showed its similarity to that of the vitellin of hens' eggs and suggested to the authors that lactoglobulin is a similar lecithalbumin or mixture of proteins. That only a trace of phosphorus was found in lactalbumin would indicate that the phosphatids previously obtained from the coagulated protein of milk (E. S. R., 23, p. 690) are not associated with the purified lactalbumin but with the globulin.

Experiments to determine whether or not proteoses are original constituents of milk were unsuccessful. Examination of Siegfried's "nucleon"¹ shows that it is probably a mixture of uncoagulable protein and some still unidentified organic substances yielding phosphoric acid on hydrolysis. From the alcoholic washings of casein a protein was isolated resembling gliadin of wheat in its solubility in alcohol. An investigation of its physical and chemical properties is to be reported later.

Adenin and guanin in cow's milk, C. VOEGTLIN and C. P. SHERWIN (*Jour. Biol. Chem.*, 33 (1918), No. 1, pp. 145-149).—This article reports in detail the methods and data in the determination of adenin and guanin in milk, previously noted (E. S. R., 37, p. 308). The question as to whether the purins of milk are derived from the blood purins or formed from the breaking down of the nucleic acid in the mammary gland is still undecided.

Standard methods of sampling and analysis and standard samples, W. F. HILLEBRAND (*Proc. 2. Pan Amer. Sci. Cong.*, 1915-16, vol. 8, pp. 68-83).—Previously noted from another source (E. S. R., 35, p. 415).

A simple, efficient, and economic filter; its application to the filtration of the yellow precipitate in phosphoric acid estimations, S. L. JODIDT and E. H. KELLOGG (*Proc. 2. Pan Amer. Sci. Cong.*, 1915-16, vol. 8, pp. 704-708).—Previously noted from another source (E. S. R., 35, p. 314).

The application of the paper pulp filter to the quantitative estimation of calcium and magnesium, S. L. JODIDT and E. H. KELLOGG (*Proc. 2. Pan Amer. Sci. Cong.*, 1915-16, vol. 8, pp. 843-849).—Previously noted from another source (E. S. R., 34, p. 712).

A quantitative estimation of acetic, propionic, and butyric acids, R. D. CROWELL (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 2, pp. 453-460).—The method employed by the author consists in the extraction of butyric acid by means of kerosene from an aqueous solution to which calcium chlorid and a little potassium chlorid have been added as salting agents. Some propionic acid is extracted with the butyric, but can be determined by the method of distillation and neutralization with barium hydroxid. The method is described in detail and data given of the mean error in the method of separation.

Experimental work with the method suggested by Phelps and Palmer (E. S. R., 37, p. 206) proved unsatisfactory.

The identification and estimation of lead in water, I. R. MELDRUM (*Chem. News*, 117 (1918), No. 5036, pp. 49, 50).—This is a report of investigations into the sensitiveness and reliability of the hydrogen sulphid and potassium chromate colorimetric methods for the detection and estimation of lead in water.

It is pointed out that with the hydrogen sulphid process different waters with equal lead contents give unequal coloration intensity due to the coloring matter in the water sample and also to its saline constituents and other unknown factors. This error may be overcome by using as a standard instead of distilled water, a sample of the same water which has been rendered lead free. When distilled water is used for the standard, the lead is likely to be underestimated by at least 25 to 33 per cent. With the same water at variable lead dilutions with slightly excessive ratios of reagents, the resulting coloration for any specific lead dilution is also not constant as regards the hydrogen sulphid process.

The hydrogen sulphid colorimetric process in use by the author is described in detail. Experimental data will be given later.

The manganese content of the ash of certain drugs, L. E. WESTMAN and R. M. ROWAT (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 3, pp. 558-562).—Data

¹ Hoppe-Seyler's Ztschr. Phys. Chem., 21 (1895-96), No. 5-8, pp. 373-375.

are given of the manganese content of certain laxative drug plants. It has been found that for the family Rhamnaceae the manganese is extracted by water proportionately to its total amount in the bark.

The inversion and determination of cane sugar. A. R. ROSE (*Proc. Soc. Exp. Biol. and Med.*, 15 (1917), No. 2, pp. 16, 17).—The use of picric acid in the inversion and determination of cane sugar in solutions and extracts is described as follows:

One cc. of the clear liquid containing the sugars is transferred to each of two graduated test tubes containing 2 cc. saturated solution of picric acid. To one of the tubes is added 1 cc. of 20 per cent sodium carbonate. The two tubes are heated for 10 minutes in a bath of boiling water. The same amount of sodium carbonate is added to the second tube and the heating of both tubes continued for 30 minutes. The tubes are cooled and the contents diluted to a suitable volume and matched against a standard solution in a colorimeter. The difference in the readings of the two tubes represents the invert sugar from the sample.

In applying this method to solids, such as mashed fruit pulps, from 1 to 10 gm. are taken and triturated in a mortar with 100 cc. of water and a clear liquid obtained by filtering and centrifuging.

It is suggested that picric acid may also be used as the inverting agent in the determination of cane sugar by polarizing. It has no effect on polarized light and in some cases acts as a clarifier and remover of soluble proteins.

The preservation of plant juices for analysis of sugar content. D. O. SPATENSBACH (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 2, pp. 331-336).—In the course of sorghum investigations at the Minnesota Experiment Station the author examined the action of different preservatives on plant juices to prevent fermentation and hydrolysis of the sugars and at the same time not to interfere with the proper determination of the composition of the juice. Potassium and mercuric potassium iodid were both tested. The latter apparently possesses the greater preserving power. Both showed the maximum effect in acid samples which had been rendered slightly alkaline with sodium carbonate. From 0.05 to 0.1 per cent potassium mercuric iodid was used or sufficient toluene to saturate the solution.

Preliminary investigations with mercuric nitrate have indicated that it may be even more effective than mercuric potassium iodid.

Home canning of meats (*Okla. Agr. Col., Ext. Div. Circ. 63* (1917), pp. 8).—This circular gives a list of materials necessary for the successful home canning of meats and general directions for the preparation of meat and for filling and pressure driers and portable evaporators is included.

How to dry fruits and vegetables for home consumption. C. D. MATTHEWS (*V. C. Agr. Ext. Serv. Circ. 50* (1917), pp. 14, fig. 1).—The author has compiled the available information on the different methods of drying fruits and vegetables, varieties of driers, and related topics. Detailed directions for the drying of certain vegetables and fruits are given, and a list of firms making pressure driers and portable evaporators is included.

Action of manganese sulphate in wine fermentation. J. B. LARA (*Proc. 2. Int. Amer. Sci. Cong.*, 1915-16, vol. 8, pp. 839-843).—The investigations reported show that the addition of manganese sulphate to grape must causes a greater multiplication of yeast. The optimum proportion to be added is 0.005 gm. of the sulphate per liter. A larger amount causes the consumption of all the fermentable sugar by the yeast, imparting to the wine a less agreeable taste. The wine obtained after the addition of manganese sulphate contains no higher percentage of alcohol but has a more aromatic flavor.

Alcohol from discard molasses in the Philippine Islands, H. C. BAILEY and L. W. THURLOW (*Philippine Jour. Sci., Sect. A, 12* (1917), No. 6, pp. 267-292).—Some statistics of the alcohol industry in the Philippine Islands and abroad are given and investigations of methods to improve the process of fermentation of molasses as conducted in the Philippines reported. They include several trial experiments on a large scale with and without temperature control. Methods and analytical data are given in detail.

The authors recommend the sterilization of the molasses solution wherever practical, or at least the use of good water for diluting the molasses to a definite density, about 16.5° Brix. Two gm. of sulphuric acid and at least 64 gm. of ammonium sulphate should be added to every liter of ferment. The yeast should be grown from pure stock and used in the proportion of 1 part of fermenting wort to 100 or 150 parts of the ferment. The most efficient process was found to be the Molhan method, as applied by Mirior,¹ of increasing the resistance of yeast to more concentrated solutions of alcohol by beginning with a 10 per cent solution of molasses and gradually increasing the strength. The optimum temperature of reaction was between 28 and 30° C.

A handbook for cane-sugar manufacturers and their chemists, G. L. SEYLER (New York: John Wiley & Sons, Inc., 1917, 6. ed., enl., pp. XV+561, 39c. 97).—This well-known handbook (E. S. R., 35, p. 114) has been enlarged to include a chapter on Evaporation and Juice Heating, by W. H. P. Creighton. This chapter includes a discussion of methods of juice heating, with diagrams of apparatus, and of methods of calculation with data from various types of sugarhouse evaporators.

Modern margarin technology, W. CLAYTON (*Jour. Soc. Chem. Indus.*, 36 (1917), No. 23, pp. 1205-1209; *Rev. Gén. Sci.*, 29 (1918), No. 1, pp. 22-27; *Sci. Amer. Sup.*, 85 (1918), No. 2200, pp. 134, 135).—This article gives a brief history of the margarin industry and a summary of the methods now employed in its manufacture.

Determination of the rubber content of latex in the mixing tank for bringing to a standard dilution, J. C. HARTJENS (*Arch. Rubbercult. Nedriand Indië*, 1 (1917), No. 5, pp. 367-374; *Meded. Proefstat. Malang, No. 20* (1917), pp. 8).—This article reports the results of experiments to ascertain whether the rubber content of bulked latex about half an hour before all the latex had been received differed markedly from the rubber content after all the latex had been received and bulked. The experiments were conducted on five different estates. Samples were taken out of the mixing tank after one-third, two-thirds, and all of the latex had been received. There appeared to be only a small difference in the rubber content of the bulked latex at the different periods of sampling, and consequently there is thought to be no practical objection to taking the sample for determination of rubber content by coagulation before all the latex has been received.

Safety for the household.—VI, Hazards arising from the use of chemicals (U. S. Dept. Com., Bur. Standards Circ. 75 (1918), pp. 109-117).—This discusses, first, the dangers from materials in common use without thought of risk, since they in themselves are harmless, and in some cases necessary for existence. The contamination of the water supply by means of lead or bacteria or the formation of ptomaines in food are examples. It then considers dangers from materials of unknown or not generally known properties and composition in more or less restricted use, such as the use of rodent poisons, disinfecting and fumigating materials, or the careless storage or use of dangerous chemicals, such as caustic soda or corrosive sublimate.

¹ Bull. Assoc. Chim. Sucr. et Distill., 81 (1914), No. 11, pp. 936-940.

METEOROLOGY.

Some temperature correlations in the United States. T. A. BLAIR (*U. S. Weather Rev.*, 45 (1917), No. 9, pp. 444-450, figs. 8).—Applying the methods of Craig¹ in a study of temperatures in the United States, the following relationships are developed in this paper:

—There is a well-marked seesaw relation between the temperatures of southern California and of the southeastern United States for certain months of the year; for other months the temperatures vary independently; these changes in relationship are not wholly seasonal but appear to have a wave-like oscillation in value; in consequence, the coefficients expressing the annual temperature correlations have intermediate values; there is a definite daily correlation during the time of greatest monthly correlation."

Weather and the yield of winter wheat (*U. S. Dept. Agr., Nat. Weather and Crop Bul.* 32 (1917), p. 3, figs. 2).—A study of data for rainfall and crop yields in Kansas (24 years), Missouri, and Ohio (54 years) indicated that the yield of winter wheat in those States is not controlled by variations in the rainfall for any month or combination of months of the preceding year. The mean temperature for March, however, "apparently influences the yield of wheat in Ohio to a marked extent," that is, a warm March is generally followed by a good wheat yield. "In a study of the relation of the temperature to the yield of winter wheat in Illinois, however, covering a period of 36 years, the marked relation that was found in Ohio was not evident."

Influence of weather conditions on the amounts of nitrogen acids in the rainfall and atmosphere in Australia. O. MASSON (*Rpt. Brit. Assoc. Adv. Sci.* 86 (1916), pp. 128, 129; *abs. in U. S. Mo. Weather Rev.*, 45 (1917), No. 10, p. 591).—The results of examinations of about 1,000 daily samples of rain collected at about 16 stations suitably distributed over the continent of Australia, as compared with the daily weather records and isobaric charts, confirm the conclusions of Anderson already noted from another source (*E. S. R.*, 33, p. 617), to the effect that "for a given type of weather the concentration of oxidized nitrogen in the rainfall varies inversely as the amount of rainfall. The total amount of oxidized nitrogen per unit area found in the rainfall accompanying a storm, depends on the type of weather (Antarctic control, tropical control, divided control), and is practically independent of the amount of rainfall."

The results led to the further conclusions that "Antarctic storms at different stations carry down amounts of oxidized nitrogen which do not differ greatly from the amounts previously found at Canterbury [by Anderson]. Rain falling at northern stations (equatorial stations) during the prevalence of trade winds contains amounts of oxidized nitrogen which are almost equal to the amounts found in the rain accompanying Antarctic depressions (rear isobars) at southern stations. This is shown to be probably due to the anticyclonic origin of winds accompanying both types of rain. Passage over land modifies anticyclonic air only to a slight extent; but if, during the passage, it is subjected to the influences accompanying monsoonal disturbances, comparatively large amounts of oxidized nitrogen are found in the subsequent rainfall. The highest total amounts of oxidized nitrogen are found at southern and inland stations in rain water resulting from monsoonal storms following a 'heat wave.' Rains occurring during 'divided-control' weather contain less oxidized nitrogen than tropical rains, but more than Antarctic rains. The nitrogen-fixing powers of inland monsoonal depressions tend toward the gradual enrichment, in respect of oxidized nitrogen, of the soil in southeastern Australia.

¹Quart. Jour. Roy. Met. Soc. [London], 41 (1915), pp. 89-93.

"A number of determinations of the volume concentration of nitrogen peroxide in the atmosphere during the prevalence of anticyclonic weather has shown that at Canterbury, Victoria, in the rear circulation of anticyclones the air contains a greater proportion of nitrogen peroxide than the air of the front circulation. On the assumption that the oxidized nitrogen of the rainfall is derived from the atmosphere, the amounts of nitrogen peroxide in the rain were compared with the amounts of oxidized nitrogen found in the rainfall at Canterbury for the corresponding weather types. It is shown that air containing 0.53 volume of nitrogen peroxide per 10³ volumes in the rear of an anticyclone would require to be washed out to a height of about 4,000 ft. above ground-level in order to give the amount of oxidized nitrogen usually found in the rainfall accompanying this weather condition. Similarly, in the case of the front of an anticyclone, it is shown that the height would require to be about 3,100 ft. The above are in fair agreement with the average altitude of rain clouds (base), which according to leading authorities is about 3,500 ft.

Lunar period in the rates of evaporation and rainfall, J. R. SUTTON (*ibid.* in *Nature* [London], 100 (1917), No. 2504, p. 160; *U. S. Mo. Weather Rev.*, 45 (1917), No. 10, p. 501).—The paper "directs attention to the possibility of lunar influence governing the evaporation from a water surface, and a lunar period in the incidence of rainfall. Tables are given showing that as the result of hourly observations of evaporation and rainfall during the 120 lunar months from August, 1899, to April, 1909, rainfall has its maximum frequency about the time of moonrise and its minimum just after moonset; also that the rate of evaporation has a maximum and minimum, respectively, shortly after the moon passes the meridian above and below the horizon."

Forests and rainfall experiments (*U. S. Mo. Weather Rev.*, 45 (1917), No. 9, p. 453).—Referring to a review by H. R. Mill of an article by M. Hill (*U. S. Mo. Weather Rev.*, 37, p. 718), attention is called to the fact that one of the methods proposed by Mill for studying the relations between rainfall and forestation has been in use by the U. S. Weather Bureau, cooperating with the Forest Service, since 1910 in two contiguous and practically identical watersheds in the El Grande National Forest. These watersheds are "at present under identical forested conditions, and have established therein a large number of thermometer, precipitation, and stream-gauge stations. Careful observations will be carried on in both watersheds for a number of years, and at the conclusion of this first period one of the watersheds will be deforested and the same observations continued for a second period corresponding to the first one."

Monthly Weather Review (*U. S. Mo. Weather Rev.*, 45 (1917), Nos. 9, 10, pp. 439-479, pls. 8, figs. 9; 10, pp. 480-528, pls. 9, figs. 11).—In addition to weather forecasts, river and flood observations, and seismological reports for September and October, 1917; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the month; solar and sky radiation measurements at Washington, D. C., during September and October, 1917; condensed climatological summaries and the usual climatological tables and charts, these numbers contain the following articles:

No. 9.—Döppler's Principle for a Windy Atmosphere, by H. Bateman; Propagation to Great Distances of the Sound of Cannonade at the Front, by G. Bigourdan; Acoustic Efficiency of Fog-signal Machinery, by L. V. King; Surface Currents of Jupiter, by S. Bolton; Effect of Terrestrial Relief on Ionospheric Densities in the Atmosphere, by P. L. Mercanton; Observations of Atmospheric Electricity During the Total Solar Eclipse on October 10, 1912, at Boa Vista, Brazil, by W. Knoche and J. Laub; Release of Radium Emanation from Water

at Different Temperatures, by J. Morán; Absorption Bands of Atmospheric Gases in the Spectra of Sun and Stars, by A. Fowler and A. J. Strutt; Some Temperature Correlations in the United States (illus.), by T. A. Blair (see p. 460); Rainfall and Gunfire, by A. Angot; Bird Migration in Central Switzerland in Relation to Meteorological Conditions, by K. Bretscher; Some Nuclei of Cloudy Condensation, by J. Aitken; Condensation and Evaporation of Gas Molecules, by I. Langmuir; Computation and Measurement of the Complex Molecules of Some Vapors, According to the New Condensation Theory, by L. Andrén; A New Evaporation Formula, by R. E. Horton; Forests and Rainfall Experiments (see p. 510); Excessive Precipitation in London, England, by H. R. Mill; Greatest 24-hour Rainfall at Washington, D. C.; Revolving Cloud in the Atmosphere, by N. Shaw; Motion of a Particle on the Surface of a Smooth Rotating Globe, by F. J. W. Whipple; Motion of the Air in the Lowest Layers of the Atmosphere, by G. Hellmann; The Relation Between Pressure-gradient, Wind, and Friction in Steady Motion, by F. Åkerblom; The Formation of Anticyclonic Stratus, by C. K. M. Douglas; Windward Winds on Leeward Islands (illus.); and Canadian Astronomical Appointments, No. 19.—Atmospheric Optical Disturbances, Fall of 1911 to February, 1917, by C. Dorno; Transparency of the Atmosphere for Ultra-violet Radiation, by R. J. Strutt; A. Brester's Theory of the Sun; Lunar Rainbow, by H. A. French; Haze of October 3, 1917, in Texas and Ohio (illus.); Device for Observing Radiants of Auroras; Notes on the Climate of France and Belgium (illus.), by P. C. Day (see below); Fog Along the California Coast (illus.), by A. H. Palmer; Relative Frequency of Fog at United States Lighthouses; Glaze, "glazed roads," "Ammil"; Great Thunderstorm of August 1, 1917, in Trinity County, Cal.; Heaviest Rainfall in the British Isles; Influence of Weather Conditions on the Amounts of Nitrogen Acids in the Rainfall and Atmosphere of Australia, O. Musson (see p. 509); Lunar Period in the Rates of Evaporation and Rainfall, by J. R. Sutton (see p. 510); John West James, 1838-1917; Tropical Hurricane of September 27-28, 1917, in Southeastern Louisiana (illus.), by R. A. Dyke; and Annual Rise of the Columbia River, 1917 (illus.), by E. M. Keyser.

Notes on the climate of France and Belgium, P. C. DAY (*U. S. Mo. Weather Rev.* 45 (1917), No. 10, pp. 487-496, figs. 7).—The climatic conditions are quite fully discussed, especially from the standpoint of bodily comfort.

SOILS—FERTILIZERS.

Soil acidity and the hydrolytic ratio in soils, C. H. SPURWAY (*U. S. Dept. Agr. Jour. Agr. Research*, 11 (1917), No. 12, pp. 659-672).—This article reports investigations made at the Michigan Experiment Station, the results of which are summarized as follows:

"A definite relationship was found between the ratios of calcium to iron and aluminum soluble in fifth-normal hydrochloric acid and the soil reaction. All the acid soils have ratios $\text{CaO} : (\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3)$ above 1:1.3, and all the alkaline soils have ratios below this figure. It is believed that the reactions of the soils studied depend chiefly upon the hydrolytic ratios existing between hydrolyzing compounds of the alkali earths and iron and aluminum.

"A method for determining the calcium oxid required to neutralize a soil by indirect titration is described in which certain fixed quantities of a standardized calcium hydroxid solution are allowed to react separately with varying amounts of soil. The concentrations of soil and solution giving a neutral reaction are chosen from the series by comparing the electrical resistance of

the several solutions, also by means of phenolphthalein indicator. The greatest electrical resistance and faint color of the indicator is coincident with the concentration giving a neutral reaction.

"The quantities of lime required to neutralize the acid soils may be determined by computing the quantities of calcium oxid necessary to add to the acid-soluble calcium oxid found in the soils to bring the ratios $\text{CaO} : \text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$, to 1:1.3. The quantity of calcium oxid required by this factor method corresponds closely to the quantities required when determined by means of the indirect titration method, and it appears that the titration method is accurate and convenient."

The literature of the subject is reviewed and a bibliography is given.

Soil solution obtained by action of a hydraulic press, G. RAMANN, S. MANN and H. BAUER (*Internat. Mitt. Bodenk.*, 6 (1916), p. 27; *Zentbl. Agr. Chem.*, 41 (1917), p. 6; *abs. in Jour. Chem. Soc. [London]*, 112 (1917), No. 655, I, pp. 311-312).—The authors point out that the analysis of drainage waters from soils does not afford an accurate means of determining the composition of the normal soil solution, as drainage only occurs when the soils are supersaturated. For this reason they adopted the method of forcing water out of the soil with a hydraulic press. Samples of 3 kg. of soil were taken from the fields and subjected to a pressure of 300 kg. to the square centimeter, the liquid expressed being then analyzed for calcium, magnesium, sulphates, phosphoric acid, and potassium. The sampling was done on six different occasions over a period lasting from May to October; both surface and subsoil were used.

The calcium content was found to vary considerably in the surface soil, but in the subsoil it seemed fairly constant, except for a rise in midsummer. Potassium, contrary to the generally accepted view, behaved very much like calcium, that is, its content fluctuated according to the general concentration of the soil solution, rising when evaporation took place and being lowered by spells of wet weather. Further, there was evidence of potassium and calcium being transported from the subsoil to the surface during a prolonged period of drought, but no evidence was obtained that adsorption exerted any regulating effect on the concentration of the soil solution. The exchange of bases only occurred when the proportion which the dissolved substances bore to one another was altered.

The authors suggest that the selective action of the plant roots, by throwing the soil solution out of equilibrium, would have a considerable effect in bringing fresh supplies of nutrient substances into solution. They state also that the pressure method of obtaining soil water is only applicable in the case of soils made up of very fine particles or containing a considerable amount of humus.

The classification of soils according to the electrical conductivity of their aqueous extract, B. von HOWATH (*Internat. Mitt. Bodenk.*, 6 (1916), No. 4, pp. 230-236; *abs. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 2, p. 195).—Studies on the electrical conductivity of the water extracts of about forty soils including gray and brown forest soils, prairie clay, black and brown steppe soils, salt soil, alluvial, and sandy soils are reported to determine whether electrical conductivity of the water extract of soil can furnish a criterion for soil classification. A great variation in electrical conductivity of the extracts was found and the conductivity of the same soil was changed after cultivation. Since electrical conductivity of the aqueous soil extract represents only the relative content of soluble salts it is considered of no value for soil classification.

Soil survey of Pickens County, Ala., A. M. O'NEAL, JR., J. L. ANDRESS, J. M. MOORE, and E. H. STEVENS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur.*

Soils, 1916, pp. 41, fig. 1, map 1).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 500,000 acres, situated in western Alabama, bordering the State of Mississippi. "The topography is prevalently very rolling to hilly, with broad, level terraces along the Tombigbee and Sipsey Rivers and a few of the larger creeks and broad, flat first bottoms along all the streams." Drainage is said to be generally well established.

The county lies entirely within the Coastal Plain province, the soils having been derived from unconsolidated deposits of sands, gravels, and clay; from slightly consolidated, calcareous deposits; and from alluvial deposits. Nineteen soil types of 13 series are mapped. Ruston fine sandy loam and Tusquehanna fine sandy loam predominate, occupying 36 and 17.4 per cent of the total area of the county, respectively.

Soil survey of Craighead County, Ark., E. B. DEETER and L. V. DAVIS (U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 32, pl. 1, fig. 1, map 1).—This survey deals with the soils of an area of 453,120 acres in northeastern Arkansas. Four-fifths of the county consists of flat to gently undulating stream bottoms and terraces, the remainder being occupied by Crowleys Ridge, the topography of which ranges from gently rolling to very hilly. Drainage in the uplands is good while that of the greater part of the lowlands is generally poor.

The upland soils of the county are derived from loessial material, and the lowland soils from first-bottom and second-bottom alluvial material. The soils range in texture from heavy plastic clay to loamy sand. Thirteen soil types of 9 series are mapped. Calhoun silt loam and Sharkey clay predominate, occupying 33 and 14.1 per cent of the total area, respectively.

Origin and properties of agricultural soils, especially of Java, E. C. J. MOHN (Teymannia, 28 (1917), No. 3, pp. 137-151).—This is a discussion of the factors affecting agricultural soil formation, with particular reference to Java soils.

Description of the coffee soils of Paseroean and Kediri, Java, M. W. SIXTUS (Meded. Proefstat. Malang, No. 15 (1916), pp. 15).—The physical, mechanical, and chemical properties of these soils are discussed with analytical data.

Sticky soils (kleefgrond) and red soil (terra rossa) of Limburg (Netherlands), D. J. HISSINK (Verhandl. Geol. Mijnbouwk. Genoots. Nederland en Kolon., Geol. Ser., 2 (1917), No. 5, pp. 197-221).—Chemical studies on the origin and formation of a sticky clay soil and of red soil in south Limburg are reported.

It is concluded that both the sticky clay and the red soil of the region are products of the weathering of limestone residue. The difference between the two products appears to be indicated by the solubility of weathered silicates in hydrochloric acid. The red soil consisted of a very basic weathered silicate and was practically laterite.

The results of further studies of the process of laterization are taken to indicate that climate and locality influence the weathering of limestone by carbon dioxide, and that laterization in the Karst region may be attributed to the basic reaction of the soil solution.

Soil survey.—I, Pas Geometriques (Dept. Agr. Mauritius, Coll. Circ. 1 (1916), [English Ed.], pp. 4, pl. 1).—Physical and chemical analyses of the soils of a strip of land 250 ft. wide extending around the Island of Mauritius are reported.

The soils are mainly calcareous sand, containing from 80 to 89 per cent of calcium carbonate. Sometimes they are mixed with earth, thus reducing the calcium carbonate content to from 21 to 64 per cent. Physically the sandy soils

are very permeable. The nitrogen content varies within wide limits. The phosphoric acid content originates only from the organic matter content. It is shown that the nitrogen and phosphoric acid increase in the same proportions. The calcareous sands are poor in potash, while the black and gravelly soils contain the most potash.

"The percentage of available elements in these soils is very low. Apart from the alluvial soils of the 'Gorges' of Black River, the rest contains but traces of phosphoric acid. . . . In every place where calcareous sand is in large proportion, only traces of available potash are found. On the other hand, in black soils and other uncultivated ones comparatively high percentages are met with, and these percentages are well above those of the cultivated soils."

Soil survey.—II, Grand Port (*Dept. Agr. Mauritius, Soil Circ. 2* (1914) [English Ed.], pp. 3, pl. 1).—This survey (Part 1 of Section II) reports physical and chemical analyses of samples of the soils of lands forming a narrow valley between the Creole Mountain on the east and the highlands east of Rivière Eau Bleue on the west in the Island of Mauritius.

The nitrogen content is considered normal, but available phosphoric acid is present only in traces. The potash content is low.

Soil flora studies, I–V, H. J. CONN (*Jour. Bact.*, 2 (1917), Nos. 1, pp. 35–42, 2, pp. 137–154).—The substance of this article has been abstracted from another source (*E. S. R.*, 37, pp. 516, 517).

The recent work at Rothamsted on the partial sterilization of soil, E. J. RUSSELL (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1917), No. 5, pp. 673–681).—This is a general review of the work on partial sterilization of soil at the station, most of which has been noted from time to time.

Treatment of peat beds to prevent loss of nitrogen by bacterial action. T. ARND (*Landw. Jahrb.*, 49 (1916), No. 2, pp. 191–213; *abs. in Chem. Zentr.*, 1916, II, p. 237; *Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 10, pp. 1414, 1415; *Chem. Abs.*, 11 (1917), No. 10, p. 1513).—Experiments conducted at the Bremen station for peat investigations are reported to determine whether denitrification and the decomposition of nitrates in peat beds can be prevented. Two methods were used: "(1) Soil conditions were made such as to encourage nitrification and processes favorable to plant growth; and (2) the reduction of nitrates was inhibited by the use of germicides. By the first method denitrifying organisms alone were affected, while by the second method the destruction of both denitrifiers and nitrate reducers was involved."

The soil used in the first method was from a well-rotted peat bed, crumbly and rich in bacteria and containing fair quantities of ammonia, traces of nitrates, but no nitrites. "The sample was put through the 3-mm. sieve and mixed with pure calcium carbonate at the rate of 0.3 gm. of carbonate to 40 gm. of soil (these proportions having previously been shown to produce maximum nitrogen losses). The soil was watered to bring it up to its original water content and placed in glass vessels in layers 0.8 cm., 3 cm., and 9 cm. thick; 0.5 gm. of dry nitrate was added to each vessel, which was then plugged with cotton wool and incubated for a fortnight at 25° C. . . ."

"The results showed conclusively that denitrification varies with the depth of the soil layer in the vessels, i. e., with the amount of oxidation which can take place. . . . The mean total losses of nitrogen for the three layers (9 cm., 3 cm., and 0.8 cm.) were 17.8 mg., 2.1 mg., and 3.8 mg., respectively. Where the soil was very loosely packed no denitrification took place, but in other

even thin layers of less than 1 cm. thickness showed losses of nitrogen, and it may be concluded that under field conditions where the soil could never have such a large surface exposed as in these experiments, denitrification could never be completely prevented. In practice, therefore, tillage and drainage of peat soils may be always recommended in order to minimize denitrification, but some losses must always be expected from that cause."

With the second method the same apparatus was employed but the soil layers were uniformly 9 cm. thick. The germicides were mixed with the soil in the dry state or in solution at the rate of from 25 to 200 mg. per 60 to 70 gm. of soil.

Even with the maximum doses of 0.2 gm. of copper sulphate per 12 gm. of dry soil, losses of nitrogen were not completely avoided. With the small doses denitrification was intensified. This unexpected behavior on the part of copper sulphate was probably due to the fact that the greater part of the salt is precipitated as humates in a peaty soil and thus loses its toxicity. The humates which are hardly ionized actually seemed to have a stimulating effect on the denitrifying bacteria."

Neither magnesium sulphate nor zinc sulphate totally inhibited denitrification. Zinc sulphate diminished the action slightly, but with magnesium sulphate it was nearly always slightly increased.

In a last series of experiments disinfectants which did not owe their germicidal properties to ions were used, i. e., carbolineum, toluene, and carbon bisulphid. Where carbon bisulphid was used the period of incubation was increased from two to five weeks, during which time the soil was maintained at ordinary room temperature instead of at 28° C. The following results were obtained: Carbolineum increased denitrification; toluene had no stimulating effect in whatever proportion used, but neither did it have an inhibitive effect except in one single instance; carbon bisulphid on the other hand always decreased denitrification even when used in very small doses. It would therefore appear that on peaty land carbon bisulphid may be recommended as the best germicide to employ."

Utilization of the fertilizer constituents contained in cane molasses, W. E. CROSS and W. G. HARRIS (*Rev. Indust. y Agr. Tucumán*, 7 (1916), No. 3, pp. 55-103; *abs. in Internat. Sugar Jour.*, 19 (1917), No. 222, pp. 281-283; *Jour. Soc. Chem. Indust.*, 36 (1917), No. 15, pp. 897, 898).—Studies of the ash of cane molasses and distillery vinasse are reported.

Analyses of the molasses ashes show the potash content to be 45 to 50 per cent. "Therefore, the ash without requiring further treatment could be used or sold as a fertilizer, or sold as crude potassium carbonate for use in the manufacture of glass or soft soap, in dye work, or in washing wool. . . .

The authors observed that by acidifying partially concentrated vinasse with sulphuric acid a complete concentration can be reached, and a black, dry, bulky granular powder suitable for transportation in bags or barrels be obtained, its composition being as follows: Phosphoric acid, P_2O_5 , 0.75 per cent; potash, K_2O , 37.5 per cent; and no nitrogen. There must exist a good market for this product, either as a concentrated potash fertilizer (containing about 40 per cent of potassium sulphate), or as potassium sulphate in crude form, to be used as such, or converted into the pure salt. . . .

Fractional crystallization, employing the same method used in the case of the molasses ash, was also tried in the case of a solution made from the dry

vinasse, after acidifying with sulphuric acid, the analyses of the three samples resulting being shown in the following table:

Results of fractional crystallization of distillery vinasse solution.

Fraction.	Lime (CaO).	Magnesia (MgO).	Soda (Na ₂ O).	Potash (K ₂ O).	Sulphuric acid (SO ₃).	Water
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
First.....	16.1	0.7	2.6	26.3	44.7	1.8
Second.....	1.1	1.0	2.1	49.4	45.9	1.6
Third.....		.6	4.4	42.0	44.7	1.8

Of the three fractions the first is the most impure, as it contains a considerable quantity of calcium sulphate, but by means of repeated recrystallization these salts would be raised in purity according to the demands of the market, though it would be difficult to effect such operations in a sugar factory economically.

"In conclusion, the authors mention another method for the utilization of some of the fertilizing elements of vinasse, namely, that of precipitating the nitrogenous matter with lime. In this process the lime is added to the vinasse in the proportion of 1 or 2 per cent and the precipitate formed is separated on filter presses, a fairly dry and hard mass with 1.9 per cent of nitrogen and 56 per cent of water being thus produced. In their experiments along this line the lime was added to the vinasse in various proportions at different temperatures, being in some tests boiled and in others left to precipitate without being heated at all." It was found that "the lime served only to extract a small proportion of the nitrogenous substance of the vinasse, so it is concluded that it is not worth while to adopt this method on a large scale with Tucumán molasses.

The rate of ammonia formation from cyanamid, C. KULLÖREN (*Swedish Kem. Tidskr.*, 29 (1917), No. 2, pp. 40-44; *abs. in Chem. Abs.*, 11 (1917), No. 12, p. 2253).—Samples of lime nitrogen containing 16.8 and 18.1 per cent nitrogen were dissolved in water and heated in an autoclave to certain given temperatures from 120 to 180° C. for equal periods of time, after which the ammonia evolution was determined. It was found that at a temperature of 120° in 15 minutes 11.3 per cent of the nitrogen had been converted into ammonia, in 45 minutes 31 per cent; at 160° in 15 minutes 48.5 per cent, in 45 minutes 83.7 per cent; and at 180° in 15 minutes 75.2 per cent. The reaction follows the equation $k = (1/t) \log A/(A - X)$, in which A represents the original nitrogen and X that at the end of the time t . The values for k for each temperature increased about 50 per cent for each 10°, the averages for each set of determinations for 10° intervals beginning with 120° being 0.00362, 0.0046, 0.00637, 0.0111, 0.0177, 0.027, and 0.0403.

Comparison of lime nitrogen with ammonium sulphate, J. M. GERRITS (*Arch. Suikerindus. Nederland, Indië*, 24 (1916), No. 44, pp. 1718-1730, fig. 1; *Meded. Proefstat. Java-Suikerindus.*, 6 (1916), No. 15, pp. 456-498, fig. 1).—This is a fourth report (E. S. R., 37, p. 123) of fertilizer experiments on Java sugar cane soils in which tests comparing lime nitrogen with ammonium sulphate were made.

Out of 59 tests it was found that ammonium sulphate gave generally better results than lime nitrogen in both cane and sugar production, and on both light and heavy soils. Lime nitrogen gave better results on light soils than on heavy soils. The use of lime nitrogen previous to planting and as a top-dressing showed that partial use of the fertilizer before planting is preferable to its total

as a top-dressing. When lime nitrogen was used a week before planting and not too extensively used as a top-dressing for young sugar cane plants, there was apparently no injurious effect.

A partial displacement of ammonium sulphate with lime nitrogen gave better results than a total displacement. In this connection the use of lime nitrogen followed by ammonium sulphate gave the best results. Lime nitrogen showed no influence on ripening.

Comparative tests of sources of nitrogen on Coastal Plains soils, T. E. Kest (South Carolina Sta. Bul. 192 (1917), pp. 3-14).—This is a report of comparative field tests at Summerville, S. C., on reclaimed wet Coastal Plains soil during 1911 to 1915, inclusive, of mixed fertilizers containing sulphate of ammonia, nitrate of soda, cottonseed meal, fish scrap, dried blood, bone meal, or tankage, as nitrogen carriers. The fertilizers were applied at the rate of 60 lbs. per acre. Comparative tests were also made of dried blood, sulphate of ammonia, and nitrate of soda (120, 75, and 100 lbs. per acre, respectively), applied as top-dressings in addition to each mixed-fertilizer treatment. Yields of corn, cotton, oats, and cowpeas for hay are tabulated and discussed for each combination indicated and the results summarized.

Complete fertilizers for corn showed very small increases irrespective of the source of the nitrogen, but organic sources gave slightly better results than inorganic sources. The average yield from the 7 nitrogen carriers was 39 bu. per acre, a gain of only 1.1 bu. over no fertilizer, and 1 bu. less than where no nitrogen was used. This is held to emphasize the inadvisability of applying nitrogen to this type of soil before planting corn. Dried blood as a top-dressing showed an average increase of 5.4 bu., sulphate of ammonia 4.7 bu., and nitrate of soda 3.7 bu. of corn per acre. These average results were lower in each case than where the top-dressings were used alone, as follows: Dried blood alone 17 bu. more than where applied in addition to complete fertilizers, sulphate of ammonia alone 5.8 bu. more, and nitrate of soda alone 3.1 bu. more. Nitrogen applied as a top-dressing gave better results in each case where the crop was refertilized than where it received an application of acid phosphate and potash before planting. These differences were: Dried blood 3.1 bu., sulphate of ammonia 5.5 bu., and nitrate of soda 5 bu. per acre.

Complete fertilizers showed material increases in the yield of cotton in every case, the average yield from the 7 sources of nitrogen being 801 lbs. of seed cotton per acre, a gain of 416 lbs. over no fertilizer, and of 171 lbs. over no nitrogen, but the same amounts of phosphoric acid and potash. As an average for the complete fertilizers, dried blood as a top-dressing showed an additional gain of 419 lbs., sulphate of ammonia 412 lbs., and nitrate of soda 307 lbs. of seed cotton per acre. Dried blood applied to cotton previously fertilized with tankage gave the best results.

Complete fertilizers applied to oats showed widely varying results where top-dressed, but better results than where no top-dressing was used. Sulphate of ammonia in a complete fertilizer gave the best results. The average increase over no fertilizer was 13.7 bu., and the increase over an application of phosphoric acid and potash 1.2 bu. per acre. Top-dressings of dried blood applied at the rate of 120 lbs. per acre showed an average increase of 24.6 bu., sulphate of ammonia at the rate of 75 lbs. per acre 34 bu., and nitrate of soda at the rate of 100 lbs. per acre 20.7 bu. per acre. The highest yield, 98.8 bu., was obtained with a complete fertilizer containing nitrate of soda top-dressed with dried blood.

The best average yield of cowpea hay was obtained where nitrate of soda had been used as a top-dressing.

From these results it is concluded that where a definite rotation is practiced on this type of soil and the land is in a good state of cultivation it does not pay to fertilize corn before planting, but that fertilization may be practicable when the crop is about waist high, using a rapidly available source of nitrogen. The oat crop following the corn should be fertilized with phosphoric acid, and a small amount of nitrate of soda to give it a vigorous start, and top-dressed with either dried blood, sulphate of ammonia, or nitrate of soda during the latter part of February or early in March. Potash is deemed unnecessary. Cotton should be liberally fertilized with a complete fertilizer before planting and top-dressed during its early fruiting stage.

Relation of phosphorus and nitrogen in soil to the composition of wheat. J. W. AMES and G. E. BOLTZ (*Ohio Sta. Bul. 318 (1917), pp. 91-118, figs. 5*). This bulletin reports in detail the results of studies on the yield, physical properties, protein and phosphorus content, and baking quality of wheat grown in the 5-year rotation experiments at Wooster, in experiments with floats at Strongsville, and on a number of different kinds of soils in other parts of the State. It was found "that the composition of wheat grown on soils which have received the same fertilizer treatment for 20 years is affected by the amount of phosphorus and nitrogen supplied in fertilizers.

"Fertilizers supplying phosphorus increased the size of the wheat grain. Plumpness of grain is largely dependent upon the amount of available phosphorus in the soil.

"The effect of the addition of phosphorus without nitrogen to a soil which is more responsive to phosphorus than to nitrogen fertilization has been an increase in yield but a depression of the protein content of wheat. Where the fertilizer treatment supplied nitrogen with phosphorus the protein content as well as the yield was increased. Wheat grown on soil where the fertilizer treatment included potassium with nitrogen and phosphorus had a lower protein content and produced a larger yield than when the fertilizer treatment included only phosphorus and nitrogen.

"The highest percentage of protein was found in wheat grown on soil deficient in available phosphorus and well supplied with available nitrogen. Nitrate of soda alone caused the largest increase in protein content of wheat and produced only a slight increase in yield. The proportion of phosphorus to nitrogen supplied by the fertilizer and differences in the availability of the nitrogen have apparently been factors responsible for variations produced in the protein phosphorus content of wheat grown under these conditions. The protein content of wheat grown on soil where nitrogen was supplied by organic carriers, tankage, and dried blood was less than where nitrate of soda was used, the same additions of phosphorus, potassium, and nitrogen being made to the soil in both instances.

"There was a tendency for the protein in the flour to parallel the increased protein content of wheat where the supply of available nitrogen in the soil was increased. Nitrate of soda depressed the phosphorus content of wheat when applied in combination with phosphorus as well as when used alone. Phosphorus furnished by floats has decreased the protein and increased the phosphorus content of wheat on Strongsville soil. This effect was produced in wheat grown on soil which had received applications of acid phosphate as well as in wheat grown on unfertilized soil, and was most pronounced where nitrogen without phosphorus was applied.

"The loaf volume of bread obtained in baking tests of flour produced from these wheats varies as the protein content of the wheat and flour. Different varieties of wheat grown on the same soil exhibit wide variations in the

nitrogen and phosphorus content which do not in all cases have a direct relation to the baking quality of the flour milled from the wheats.

The same variety of wheat, grown in different localities throughout the State on soils which contain varying amounts of phosphorus and nitrogen, does not show the effect of differences in the total supply of phosphorus and nitrogen that is produced in wheat grown on the same soil where the nitrogen and phosphorus supply has been modified by the fertilizer treatment."

Studies on the solubility of phosphoric acid in mineral, calcareous, and basic phosphates and in phosphatic slag. A. AITA (*Agr. Mod. [Milan]*, 23 [1916], No. 9, pp. 123, 124).—Experiments are reported and the conclusions drawn that phosphatic slag contains phosphoric acid in the form of tricalcium phosphate, which is fairly soluble in citric acid. In contrast to the mineral phosphates, this is attributed to the specific action of iron and aluminum ions present in the slag. The difference in the solubility of the different slags is attributed to their varying content in iron and aluminum.

Some factors influencing the solubility of phosphoric acid in mixed fertilizers containing superphosphates, E. V. FLACK (*No. African Jour. Sci.*, 15 [1916], No. 5, pp. 201-208; *Chem. News*, 115 (1917), No. 3004, pp. 291-294; *Abstr. Chem. Soc. Chem. Indus.*, 36 (1917), No. 15, p. 897).—Experiments are reported from which the following conclusions are drawn:

Superphosphate can remain mixed for as long as three weeks with either sulphate of ammonia or sulphate of potash or kainit without an appreciable loss of water-soluble phosphoric acid, and if mixed with sulphate of ammonia there is a possibility of an actual increase of water-soluble phosphoric acid in a period of three weeks. If immediate reversion of water-soluble phosphoric acid is to be avoided, Government guano should on no account be mixed with superphosphate, for in a mixture of equal parts of the two there was after three hours, a total loss of nearly 7 per cent of the water-soluble phosphoric acid. In the case of bone meal there is a loss of 2 per cent of water-soluble phosphoric acid in three hours, but if left for a period of seven days there is considerable loss, amounting to over 14.5 per cent."

The effect at Borbhetta of phosphatic manures on a green crop when applied without other manure (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 1216, pp. 127-129).—Comparative fertilizer experiments with green crops on acid soil are reported, in which basic slag, superphosphate, steamed bone meal, unsteamed bone meal, and bone dust were used at respective rates of 50, 75, 100, 150, and 200 lbs. per acre.

It was found that, per unit of phosphoric acid applied, basic slag gave the most superior results, while superphosphate, unsteamed bone meal, and bone dust gave results roughly equal. Steamed bone meal gave the poorest results. The difference in the results obtained with steamed and unsteamed bone meal is attributed to the greater fineness of the latter. The bone products gave results in the reverse order of their price. The superphosphate gave results characteristic of the effects of acid manure on acid soil.

The utilization of Thomas-meal phosphoric acid with regard to its citric acid solubility, A. MITSCHERLICH (*Landw. Jahrb.*, 49 (1916), pp. 661-684; *Abstr. Chem. Zentrbl.*, 1916, II, p. 765; *Chem. Abs.*, 11 (1917), No. 15, p. 2253).—Cultivation experiments on the value of Thomas meal as a fertilizer showed that the yield of crops varied approximately as the citric acid solubility of the Thomas meal. It is concluded that there is no reason why Thomas meal should not be sold on the citric acid solubility basis.

Experiments with a new potash-phosphoric acid fertilizer, the double phosphates of potassium used in its preparation, and various other comparative

fertilizers, T. REMY (*Landw. Jahrb.*, 49 (1916), pp. 685-723; obs. in *Chem. Zentbl.*, 1916, II, p. 766; *Chem. Abs.*, 11 (1917), No. 15, p. 2253).—A description is given of the so-called Rhenania phosphate, which is prepared from dicalcium phosphate and phonolite, the phosphoric acid being rendered available to a considerable extent and the potash made practically as effective as potassium chlorid. "Good Rhenania phosphate must contain 3 to 4 per cent K_2O , 12 to 13 per cent P_2O_5 , and at least 90 per cent of fine meal. Furthermore, at least 75 per cent of the P_2O_5 must be citric acid-soluble and at least 50 per cent citrate-soluble. Tables are given showing the solubility in various solvents of the P_2O_5 and K_2O in the raw materials, Rhenania phosphate, and two similar preparations (Wolter phosphate and Gafsa phosphate)."

Schröder's phosphate-potash, its preparation, manner of action, and utilization, M. POPP (*Landw. Jahrb.*, 49 (1916), pp. 729-795; obs. in *Chem. Zentbl.*, 1916, II, p. 767; *Chem. Abs.*, 11 (1917), No. 15, p. 2253).—Culture experiments conducted at four experiment stations are reported with so-called Schröder's phosphate-potash fertilizers which are prepared by heating raw phosphate with calcium chlorid and magnesium chlorid. The potash was found to act similarly to that of Stassfurt salts, the phosphate-potash fertilizer having the same effect on cereals as 40 per cent potash salts. The yield of potatoes was decreased, due to the action of the chlorin content. The Schröder fertilizer and Thomas meal gave about equally valuable results.

Potash from tule and the fertilizer value of certain marsh plants, P. I. HIBBARD (*California Sta. Bul.* 288 (1917), pp. 187-192).—Limited studies of California marsh vegetation, particularly tule (*Scirpus lacustris*) but including certain sedges and cat-tails, indicate that from 100 to 200 lbs. of potash per acre may be obtained from a heavy growth of tule at an approximate cost of from \$5 to \$10. The percentage of ash in samples of fresh material analyzed varied from 1.8 to 8.6, averaging a little over 3 per cent, and the potash from 0.05 to 1.23, averaging about 0.67. Analyses of crude ash showed that 43.3 per cent of it was soluble in water, and that it contained from 7 to 15 per cent of potash, mostly chlorid and sulphate. The crude ash is not deemed suited for mixture with other materials to make high-grade fertilizers but is more valuable for the extraction of high-grade potash salts.

Fresh tule was found to contain about 6 lbs. of nitrogen, 2 lbs. of phosphoric acid, and 12 lbs. of potash per ton, the proportion varying considerably with the season, locality, and treatment, and it is regarded as comparable with barnyard manure or Pacific coast kelps for fertilizing purposes. Three successive leachings of one day's duration each extracted 85 per cent of the total potash of the plants, and their harvesting before the leaching action of rain sets in is deemed desirable.

While potash recovery from tule may not be commercially profitable it is thought that it may be of considerable local importance under present market conditions.

The importance of liming, J. HUGHES (*Jour. Bath and West and South Counties Soc.*, 5. ser., 11 (1916-17), pp. 27-44).—The use of different forms of lime on English soils is discussed.

The action of precipitated magnesium carbonate on soils, W. P. KELLY (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 6, pp. 285-297).—Experiments with two light sandy loam soils, low in organic matter, are reported which showed "that the effects produced by precipitated magnesium carbonate may differ widely from those of magnesium sulphate. The addition of comparatively small amounts of the former retarded the formation of nitrate to a marked degree while as much as 0.5 per cent of the latter produced no effect. It was also

been that the addition of other alkaline reacting substances, such as sodium or potassium carbonates and calcium oxid, produced effects similar to magnesium carbonate."

It is concluded that the toxic effects that have frequently been noted in trials with the use of magnesium carbonate have been occasioned by excessive alkalinity. "In view of the fact that the naturally occurring carbonates of magnesium produce widely different effects from the precipitated carbonate, together with the evidence set forth above, it seems reasonable to conclude that this material is unsuited for studies on the lime-magnesia ratio. With these effects on the reaction of the soil may so affect physiological processes as to obscure the effects that may be inherent within the ratio of calcium to magnesium itself, and therefore the result obtained may lead to entirely erroneous conclusions."

Artificial fertilizers: Prewar and war cost, W. C. ROBERTSON (*Jour. Dept. Victoria*, 15 (1917), No. 5, pp. 295-302, figs. 2).—This paper deals with the cost of fertilizers during the years 1907 to 1917, showing that the increases in prices over the 10-year period in Australia have been for bone dust 15 per cent, superphosphate 28, dried blood 38, sodium nitrate 36, and ammonium nitrate 56 per cent.

Analyses of commercial fertilizers, P. H. WENSELS (*Rhode Island Sta. Insp. Rep.*, 1917, Oct., pp. 3-19).—This reports the analyses of commercial fertilizers and fertilizer materials, including lime, plaster, and wood ashes, inspected during 1917. A table of lime equivalents for neutralizing purposes is presented and the amounts of water-soluble nitrogen and potash determined as well as the usual determinations. The character of the water-insoluble portion has been studied, and the chemical work supplemented by tests of the capacity of the nitrogen to supply the needs of growing plants.

Analyses of commercial fertilizers, R. N. BRACKETT ET AL. (*South Carolina Agr. Bul.* 134 (1917), pp. 3-66).—This bulletin contains the results of actual guaranteed analyses of 1,585 official samples of commercial fertilizers and fertilizer materials offered for sale in South Carolina during the season of 1916-17.

AGRICULTURAL BOTANY.

Ecological studies in the tension zone between prairie and woodland, J. E. COOK and A. E. THIEL (*Univ. Nebr., Bot. Survey Nebr., n. ser., No. 1* (1917), p. 1, fig. 6, figs. 31).—Investigations near Minneapolis, Minn., and Lincoln, Neb., are said to show that prairie soils to a depth of 30 cm. (11.8 in.) frequently lack available water during the growing season. This gives a clue to the absence of trees on high prairies. While even a brief period of lack of available water would prove disastrous to tree growth, exceptionally wet years are so favorable as to permit complete establishment and sufficient root growth for the seedling to draw upon the moisture of the deeper soil. On the other hand the prairie soil might be much drier physiologically than the graphs indicate. The whole question of the root distribution of prairie plants as correlated with the seasonal march of soil water at different depths and extended to the lower limit of the soil occupied by the roots, together with the seasonal activity of the plants, requires further investigation.

The great amount of evaporation in the prairie, together with the low water content of the soil, is deemed sufficient cause for the xerophytic character of the vegetation. It shows also the difficulties met by trees in establishing themselves in grassland and may explain their absence from the prairies.

Plants placed in the damper scrub community transpire much less vigorously than others of the same species placed in the prairie. In general there is a correlation between the evaporating power of the air and the amount of transpiration.

When sufficient light is available, the humidity of the air and soil are the most important factors affecting the establishment of the different plant communities. The progressive increase of the humidity of the habitat causes a corresponding increase of the mesophytism of the plant community.

The evaporation rates and the amount of soil moisture in the various communities of both Minnesota and Nebraska vary in general directly with the order of their occurrence in the succession, the community nearest the edge being the most mesophytic in both respects.

Redwoods, rainfall, and fog. W. S. COOPER (*Plant World*, 20 (1917), Vol. 1, pp. 179-189, figs. 2).—The studies here noted as carried out during the rainy seasons of 1913-14 and 1914-15 in the Santa Cruz Mountains by means of a simple type of rain gauge, described as making possible the summation of precipitation for long periods, are said to show that the California redwood (*quercus sempervirens*) requires a high ratio of water supply to water loss being unusually sensitive to the danger of rapid transpiration, even when the water supply is ample. During the rainless season the soil becomes dangerously dry, even in the more mesophytic habitats. In regions of deficient rainfall the redwood can exist only near permanent streams. The full development of redwood forest requires not only heavy winter precipitation but abundant and frequent summer fogs.

Incipient drying and temporary and permanent wilting of plants, as related to external and internal conditions. B. E. LIVINGSTON (*Johns Hopkins Univ. Circ., n. ser., No. 3* (1917), pp. 176-182).—Discussing recent and former work regarding circumstances connected with the phenomenon of incipient water content designated as incipient drying, the author states that the rate of absorption of water by plant roots appears to be determined by two conditions, the absorbing power of the roots (internal) and the supplying power of the medium in which they lie (external). The internal condition is at least partially controlled by the degree of incipient drying occurring in the plant which is in turn partly dependent upon the transpiration rate.

Incipient drying of leaves is due to inadequate water supply to these parts due to causes either internal or external to the plant. The data reported are considered to show that incipient drying, temporary wilting, and even permanent wilting of most of the leaves may occur without any resistance to water absorption by the roots and even in the presence of a relatively low atmospheric index. In some cases noted, at least, the inadequacy of absorbing power appears to be due to conditions internal to the plant. None of the three stages of incipient drying is necessarily related to soil-moisture conditions.

The vapor tension deficit as an index of the moisture condition of the air. B. E. LIVINGSTON (*Johns Hopkins Univ. Circ., n. ser., No. 3* (1917), pp. 173-175).—This is an analysis of the index of the air conditions which influence water loss from aerially exposed organisms into its two components, namely, the velocity of the air movement or circulation and the moisture condition of the air. It is considered important to give serious attention to the latter, which is defined as that factor in atmospheric evaporating power that is independent of the rate of air movement. The difference between the tendency for water to evaporate into air in contact with its surface (vaporization pressure) and the tendency for water to deposit liquid on the evaporating surface (condensation pressure) is the vapor pressure deficit, and is the factor of atmospheric evaporating power that is ex-

determined by air circulation. The term relative humidity is rejected, as its use is criticized.

The index of atmospheric evaporating power should equal the product of the index of circulation by the index of the moisture condition, all measurements having been properly weighted and brought into correspondence in deriving the index. "When it is not desirable or expedient to employ the index of atmospheric evaporating power itself (as determined directly by some form of instrument), the moisture condition of the air should be stated in terms of the vapor pressure deficit, which demands no correction for air temperature and may represent evaporating power in all comparisons where the index of effective air circulation may be considered as constant."

Atmometric units. B. E. LIVINGSTON (*Johns Hopkins Univ. Circ.*, n. ser., 1917, pp. 160-170).—Summarizing a discussion of atmometers and their employment, the author states that every atmometric measurement should be so related as to include all of the features, location, period of operation, units of water lost per unit of time, and type of atmometer. If any of these features is lacking, the expression for the atmometric reading has no intelligible meaning.

A simplified apparatus for measuring the conductivity of electrolytes. F. HERRARD (*Rpt. Mich. Acad. Sci.*, 18 (1916), p. 49).—This is a brief exposition of the work previously noted (E. S. R., 34, p. 732), and of the features concerning the modifications in apparatus and technique employed.

A simplification of the present freezing point method for the determination of the osmotic pressure of plant sap. O. E. HARRINGTON and R. P. HERRARD (*Rpt. Mich. Acad. Sci.*, 18 (1916), pp. 47, 48).—The work here briefly noted and reported on previously (E. S. R., 36, p. 823) was done upon fleshy tissues. Further work is considered necessary to test the applicability of the method for tissues.

Selective permeability and the plasma membrane. J. DAVIDSON (*Plant Cell*, 13 (1916), No. 11, pp. 331-349).—From the opinions and evidence here presented the author concludes that the data available regarding the existence of special plasma membranes in plants are too indefinite and indirect to warrant any conclusions at the present time, so that the term plasma membrane as used may refer to the entire cytoplasm as well as to a special membrane. There is no adequate method of testing the permeability of living cells. The usual explanation of plasmolytic phenomena, it is thought, may be incorrect notwithstanding its plausibility.

The influence of an incomplete culture solution on photosynthesis. O. M. HERRARD and R. P. HERRARD (*Rpt. Mich. Acad. Sci.*, 18 (1916), pp. 50-52).—The results here briefly noted, which were intended to determine what influence is exerted upon so-called vital activities of plants (especially photosynthesis) by an incomplete culture solution, were carried out in the greenhouse during the month of February.

The results, which are tabulated, are considered to show that the dry weight of the green of leaf surface of seedlings is less for those grown in a complete solution than for those grown in a solution which lacks one component. The impression that a large amount of photosynthate in leaves indicates energetic action is not borne out. Solutions which lack potassium, calcium, and phosphorus show relatively great gains in weight, but this is not considered as bearing metabolic efficiency in plants grown in solutions lacking these elements. It is suggested that the explanation lies in a reduced translocation and retarded photosynthesis. Tests with cucumber seedlings in the various solutions show that the increase in dry weight of detached leaves exceeds considerably that of attached leaves. The greatest gain occurred in the complete solu-

tion. Further support was afforded to the hypothesis that the absence of a component retards translocation of the photosynthate, also to the theory that the rate of photosynthesis is retarded when an essential element is lacking.

While further work is considered necessary, it appears from the data herein obtained that photosynthesis is greatly modified by the absence of a given component in the nutritive solution, the modification being expressed in the retardation of translocation and the reduced power of photosynthesis.

Studies in the physiology of the fungi.—V, The growth of certain fungi in plant decoctions, B. M. DUGGAR, J. W. SEVERY, and H. SCHMITZ (*Ann. Missouri Bot. Gard.*, 4 (1917), No. 3, pp. 279-288, figs. 5).—A continuation of the work previously noted (E. S. R., 37, p. 728), the same method being employed. Only two fungi were used, *Aspergillus niger* being taken as representative of saprophytic and *Glaeosporium (Glomerella) gossypii* of parasitic fungi. Besides the decoctions previously used, namely, bean, sugar beet, prune, potato, turnip, and corn meal, decoctions of apple, mangel (Zuckerrübe), celery, carrot, and salmon were employed. The results, as regards growth of these fungi, are exhibited in both tabular and graphical form.

The influence of different values of the hydrogen ion concentration upon the different decoctions is indicated. As in the earlier experiments, the values of P_H in solutions in which *Aspergillus* has grown are shifted toward the acid side, those in which *Glaeosporium* has grown in the opposite direction.

The formation of structures resembling organic growths by means of electrolytic local action in metals, and the general physiological significance and control of this type of action, R. S. LILLIE (*Biol. Bul.*, 33 (1917), No. 1, pp. 135-186, fig. 1).—The data herein presented and discussed raise the question whether in organic growth the essential structural condition is the presence of semipermeable and hence electrically polarized partitions separating the living substance from its medium, and at which processes of electrolysis may take place. If this is so, it is thought that the prevalence of the organic type of organization would be largely accounted for.

The similarity between the phenomena described in this paper and many of the most characteristic peculiarities of the organic growth process are considered as too detailed not to signify an identity in some essential underlying condition.

A comparison of mitochondria in plant and animal cells, N. H. COOPER (*Biol. Bul. Mar. Biol. Lab. Woods Hole*, 33 (1917), No. 3, pp. 196-228, pls. 2-4). The author, having worked on the problem of the relationship of plant and animal mitochondria as deduced from observations on these elements in relation of the pea and in the acinus cells of the pancreas of the mouse, states that the degree of similarity in animal and plant life is very remarkable. Their relations to fixatives, stains, and supravital dyes are almost identical, their distribution almost universal, and their morphology identical in plants and animals. It is thought that their chemical composition may be the same in both cases, although direct chemical analysis is obviously impracticable. Although their physiology is obscure, their wide occurrence in protoplasmic means, it is thought, that in addition to certain specific functions, such as the production of chlorophyll, they all have a common duty or part in some of the fundamental vital activity as protoplasmic respiration.

[Galactosidase β in the vegetable kingdom], MOUGNE (*Jour. Pharm. Chim.*, 7. ser., 15 (1917), No. 11, pp. 339-345).—The author tested a number of stone or seed fruits (plum, peach, apricot, cherry, apple, cherry laurel), crucifers (*Cochlearia armoracia*, *Sinapis alba*, and *S. nigra*), *Aucuba japonica*, and the fungus *Aspergillus niger*. Nearly all of these gave a decided reaction

showing the presence of galactosidase β , which is thought to exist in all plants containing lactase.

The cause of growth in the hypocotyls of oat seedlings, MARIE S. DE VRIES (*Trac. Bot. Néerland.*, 14 (1917), No. 2, pp. 109-118).—The author concludes that hypocotyl development in *Avena sativa* occurs as the result of evolution of carbon dioxide.

The department of plant physiology, B. E. LIVINGSTON (*Johns Hopkins Univ. Circ. n. ser.*, No. 3 (1917), pp. 133-159, figs. 2).—This paper, which deals with the general aims of the department and the work accomplished therein, which is intended to serve as a preface to the several preliminary reports which follow, includes a bibliography of the work in plant physiology of Johns Hopkins University during the 7½ years previous to this report.

The sexual cycle in plants, E. A. BESSEY (*Rpt. Mich. Acad. Sci.*, 18 (1916), pp. 1-17, fig. 12).—In an address before the Michigan Academy of Science the author discusses various theories regarding the development and significance of the sexual cycle in plants.

The hormone theory of chromosome action, E. A. BESSEY (*Rpt. Mich. Acad. Sci.*, 18 (1916), pp. 53-58).—Reviewing the reasons for the belief that the mechanism of heredity may be bound up with chromosomes, and, considering the possible character of their activities and their probable bearing upon the mechanism of heredity, the author subscribes to the belief that the chromosomes are the bearers of heredity.

Hybrids of *Zea tunicata* and *Z. ramosa*, G. N. COLLINS (*Proc. Nat. Acad. Sci.*, 1917, No. 5, pp. 345-349).—This article has been previously noted from *Genetic Science* (E. S. R., 37, p. 536).

A Hausa botanical vocabulary, J. M. DALZIEL (*London: T. Fisher Unwin*, 1916, pp. 119).—The author has listed the Hausa names of many of the more common plants of Northern Nigeria, giving the scientific name where known, a brief definition of the plant, and in many cases an indication of its use and of its products.

FIELD CROPS.

The overhead electric discharge and crop production, V. H. BLACKMAN and J. J. GIBSON (*Jour. Bd. Agr. [London]*, 24 (1917), No. 1, pp. 45-49, pls. 2, fig. 1), (*Nature* [London], 99 (1917), No. 2481, pp. 232, 233).—In continuation of work previously noted (E. S. R., 37, p. 336), the effect of overhead electric discharge on an oat crop during 1916 is reported. The electrified area was one acre in extent and two plots of one-half acre each were used as controls. The "electrified" screen of wire netting previously employed to insulate the control plots was deemed unnecessary, the wires being kept low. The discharge was effected by means of a series of 21 wires 4.5 yds. apart, running parallel to the long sides of the rectangular area (88 by 55 yds.). The wires were supported at a height of 7 ft. at each end, but sagged at the center to a height of 6 ft. The current applied was practically the same as heretofore, but the intensity of the discharge was much increased by the lowering of the wires, by reducing the distance between wires, and by reducing the thickness of the wire (24 gauge). The discharge was applied for 848 hours, extending over a period of 125 days.

The yield secured from the electrified area amounted to 62.8 bu. of grain and 624 lbs. of straw, as compared with a total yield of 42 bu. of grain and 2,619 lbs. of straw from the control areas. The total increased yield was valued at approximately \$30.90, while the cost of the current was approximately \$2.67.

A marked residual effect of the discharge upon the clover and grass following the oat crop of 1915 was observed and is to receive further study.

Aerial electrical discharge and increased yields (*Compt. Rend. Acad. Sci. France*, 3 (1917), No. 37, pp. 1054-1062).—A brief review and general discussion of the experimental results noted above.

Electro-culture (*Elect. Rev.*, 81 (1917), No. 2067, pp. 21-23, figs. 31-33).—The author briefly reviews experimental work in electro-culture as noted above. Electro-culture apparatus suitable for areas of from 10 to 15 acres is described and illustrated.

[Instructions for observations on the vegetative growth of cereals]. S. K. CHAIKOV and M. P. USTINOVSKIĬ (*Instruktsiia dlia Vedeniia Vegetatsionnykh Nabludenii nad Nekotorymi S.—Kh. Rasteniiami na Voronezhskom Opushch. Pol'e Gubernskago Zemstva. Chast I: Rosh, Pshenitsa, Oves, Proso i Kukuruza. Voronezh: Rosenberg Bros., 1915, pp. VII+37*).—Directions are given for the time and method of making observations on the vegetative growth of cereals in the field and laboratory, and blank forms illustrated for use in recording observations with rye, wheat, oats, millet, and corn.

Xenia and other influences following fertilization, A. E. WALLER (*Can. Jour. Sci.*, 17 (1917), No. 8, pp. 273-284).—The author discusses in some detail the phenomenon of xenia or "hybridization exposed," as he terms it, with special reference to the distinction between the changes occurring in the endosperm through triple fusion, thus directly associated with fertilization, and the changes which follow fertilization but are remote from it. It is pointed out that the xenophyte, like the sporophyte, is a fusion product, the egg nucleus of the latter fusing with one male nucleus, while in the former the second male nucleus and the definitive nucleus fuse. The definitive nucleus forms upon the fusion of two nuclei from opposite poles of the female gametophyte, the fusion nuclei appearing after three successive divisions of the megaspore nucleus, during which the egg is differentiated.

The author suggests the term "ectogony" as a proper designation of those influences which follow fertilization and are due to the developing zygote. In xenia variation is said to appear as a direct result of the introduction of heterozygous factors.

A brief bibliography is appended.

Report of the department of agriculture, Barbados, 1915-16, J. R. BENT (*Rpt. Dept. Agr. Barbados, 1915-16, pp. 2-29*).—Experimental work with seedling canes noted more fully in a previous report (*E. S. R.*, 35, p. 131), some experiments to improve the quality and increase the quantity of lint from varieties of Sea Island cotton grown in Barbados, variety tests with cross-bred economic Caladiums, economic Xanthosomas, and yams, and field tests with leguminous crops and fodder grasses have been continued. Tabulated data are given briefly describing the cotton selections and hybrids grown on the experimental plats of the Barbados department of agriculture and on the cooperative plats, and showing the market classification and value of the cotton selections grown on all plats in 1915-16.

[Field crops], J. MACKENNA (*Rpt. Prog. Agr. India, 1915-16, pp. 13-M. 43, 44, 45*).—A brief outline is submitted of progress in experimental work with wheat, rice, cotton, sugar cane, jute, indigo, tobacco, oil seeds, and fodder crops conducted at various experimental centers in India during 1915-16. The work included field tests of cultural methods and crop improvement through selection and hybridization.

Report of the Buggy experimental plat for the year 1915-16, E. THOMAS STONE (*Dept. Agr. Burma, Rpt. Buggy Expt. Plot, 1915-16, pp. 5*).—This report

continuation of work previously noted (E. S. R., 36, p. 830) with somewhat better results.

Report of the Hmawbi Agricultural Station for the year 1915-16, A. McLELLAN (Dept. Agr. Burma, Rpt. Hmawbi Agr. Sta., 1915-16, pp. 16).—Field tests with sesame, cotton, and peanut cake as a source of nitrogen for rice indicated that all three were applied at a loss. A comparison of phosphatic manures gave yields of 1,544 and 1,510 lbs. of grain per acre with 2-cwt. apatite of bone meal and dissolved bone, respectively, as compared with 740 and 700 lbs. from untreated checks. With basic slag the yield was 1,520 lbs. as with the corresponding check 1,632 lbs. Higher increased yields were obtained with combinations of ammonium sulphate and bone meal or dissolved bone than with ammonium sulphate and acid phosphate.

Field tests to compare broadcasting with transplanting rice seedlings, employing 5 lbs. of seed in each case, gave yields of 514 and 539 lbs. of grain, respectively, for the same area (0.25 acre), while the total yield of all the transplanted seedlings amounted to 1,331 lbs. from 0.6 acre. In broadcasting the best rice were secured from a 50 to 70-lb. rate of seeding.

Continuation work with rice and field tests with sugar cane and tobacco are reported.

Report of the Taikon Agricultural Station for the year 1915-16, A. McLELLAN (Dept. Agr. Burma, Rpt. Taikon Agr. Sta., 1915-16, pp. 8).—Field tests with cotton, sesame, castor beans, pigeon peas, corn, Madagascar beans, teosinte, and sugar cane are briefly noted.

Field crops work at the Koilpatti Agricultural Station], H. C. SAMPSON and R. THOMAS (Dept. Agr. Madras, Rpt. Koilpatti Agr. Sta., 1913-14, pp. 13; 1915, pp. 14, pls. 2; 1915-16, pp. 12; 1916-17, pp. 22, pl. 1).—Continuing work previously noted (E. S. R., 31, p. 733), the results of cultural and manurial tests with cereals, legumes, and cotton are reported for 1913 to 1917, inclusive. A possible value of different manures and fertilizers applied to unirrigated rice grown on black soil is briefly noted.

Field-crops work at the Manganallur Agricultural Station], H. C. SAMPSON and R. THOMAS (Dept. Agr. Madras, Rpt. Manganallur Agr. Sta., 1913-14, pp. 19; 1914-15, pp. 8; 1915-16, pp. 19).—Extensive manurial tests with rice on swamp land are reported for 1913 to 1916, inclusive, with a brief report of local agricultural practices.

Report of field crops work in the Dutch East Indies], J. VAN BREDA DE GROOT, J. E. VAN DER STOK, and M. KERBOSCH (Jaarb. Dept. Landb., Nijv. en Landb. Nederland. Indië, 1915, pp. 83-87, 124-147, 167-172, pls. 3, figs. 2).—Cultural and plant-selection tests with rice and other important East Indian crops for 1915 are reported, and the Government's bast-fiber enterprise briefly noted.

Winter grains, T. S. PARSONS (Wyoming Sta. Bul. 116 (1917), pp. 37-52, fig. 1).

After reviewing cultural and variety tests with winter grains, including hard emmer, rye, spelt, barley, and oats, and tests with spring grains sown in the fall for the period of 1911-1916, inclusive, certain conclusions have been reached and suggestions made with regard to winter grain production in Wyoming.

Winter wheat is deemed the only certain winter grain for the State other than rye, although emmer, spelt, and sometimes barley may be relied upon under good conditions. Buffum No. 17 and Turkey Red have proved to be the best winter wheat varieties. It is recommended that winter wheat be sown early (about July 15) on a summer fallow or after a cultivated crop, and that irrigation be given before seeding and summer irrigation whenever needed.

up to the ripening stage. Spring grains could not be successfully sown in the fall.

Winter rye and winter vetch grown together have resulted in good crops of excellent forage, the rye affording considerable pasturage in the fall and seeded early.

Varieties of wheat and other cereals (*Agr. Gaz. N. S. Wales*, 28 (1917), 2, pp. 85-90).—Recommendations are made of wheat, oat, barley, and the varieties deemed suited to conditions in New South Wales.

Fodder grasses, Java, C. A. BACKER (*Teyamannia*, 27 (1916), Nos. 4-5, pp. 253-266, pls. 2; 7-8, pp. 450-457, pl. 1; 28 (1917), Nos. 1, pp. 33-46, pls. 2; 29 (1917), Nos. 1, pp. 71-94, pls. 4).—These articles are a continuation of previous work (*E. S. S.*, 35, p. 440). Botanical and cultural notes on *Panicum crus-galli*, *P. colonum*, *P. distachyum*, *P. ambiguum*, *P. amplexicaule*, *P. auritum*, *P. interruptum*, and *P. indicum* are given in considerable detail, together with the results of chemical analyses and notes on the yield and feeding value of the grasses. A rather extensive list of economic and botanical literature relating to these grasses is given.

The grasses of Ohio, J. H. SCHAFFNER (*Ohio State Univ. Bul.*, 21 (1907), No. 28, pp. 253-331, figs. 15).—A botanical key to the native, introduced, and commonly cultivated grasses of Ohio, comprising about 180 species of the Gramineae.

Studies of leguminous plants, N. GANGULEE (*Poona Agr. Col. Mag.*, 8 (1917), No. 3, pp. 141-156).—The author presents the results of preliminary studies on some aspects of nitrogen fixation in certain leguminous plants suitable for green manuring in Poona. The experiments were planned to study the following points: At what stage of growth nodule development and, hence, nitrogen fixation begins; the quantity of nitrogen fixed in the whole plant at various stages of growth; the proportion of nitrogen fixed at various stages of growth, normally occurring above and below the ground, the latter being only associated with ordinary cultivation, for an increase in the permanent fertility of the land; and the influence of available potash, phosphoric acid, and lime on nodule development, and their effect on the quantity of nitrogen fixed in the whole plant at various stages of growth. Considerable tabulated data are presented and discussed and the conclusions arrived at briefly summarized for each crop used in the experiments.

Dolichos lablab began nodule formation about 15 days after germination chiefly on the primary roots. Nodules formed on the smaller roots except at the extreme ends but gradually disappeared as the plant approached maturity with only a few large nodules (about the size of a pea) remaining on the root roots. The nitrogen in the plant gradually increased from 0.21 per cent in the dried seedling to from 3.7 to 3.9 per cent in the dried plant at the flowering stage. The portions above ground contained considerably more nitrogen than the roots at all stages of growth.

Cicer arictinum developed nodules chiefly on the primary roots, although from 15 to 20 days after germination the large nodules shrank and numerous smaller ones formed on the smaller roots. Nitrogen increased from 0.23 per cent in the dried plant just after germination to 0.55 per cent at the end of the seedling stage. The above-ground portions of the seedlings are reported to have contained from five to six times as much nitrogen as the below-ground portions.

In *Crotalaria juncea* an abundant supply of nodules were found throughout the root system of healthy plants, especially in the presence of an excess of phosphates. The nitrogen increased rapidly during growth, the maximum being reached at time of full flowering and the most rapid increase occurring

between the eleventh and twenty-fifth days of growth. Nitrogen accumulation appeared to be in direct proportion to an excess of phosphoric acid and lime, and excess potash gave distinctly inferior results except in the very early seedling stages.

Nodules first appeared on *Phaseolus mungo radiatus* when the seedlings were about 10 days old. With an excess of potash and lime small nodules formed largely on the primary roots but extended throughout the root system as the plant approached the flowering stage. An excess of lime encouraged nitrogen fixation and nodule development particularly, while similar results were obtained with an excess of phosphoric acid.

Plants producing fibers analogous to that of kapok, F. MICHELOTTE (*Compt. Rend. Acad. Agr. France*, 3 (1917), No. 17, pp. 489-493).—The author lists 38 species, under 13 families, the fibers of which are somewhat analogous to that of kapok, indicating the habitat of each and its particular use.

Marine fiber, D. C. WINTERBOTTOM (*So. Aust. Dept. Chem. Bul.* 4 (1917), p. 6, pls. 17, fig. 1).—Marine fiber, consisting of the fibrous remains of the plant *Posidonia australis*, is said to occur in immense deposits in the shallow coastal water of Spencer and St. Vincent Gulfs, Australia. Detailed descriptions are given of the plant and fiber and of the operations of the three principal firms occupied in raising and cleaning the fiber. The principal uses of the product include the insulation of steam and refrigerating plants, house building and the manufacture of bedding. Fair qualities of paper have been made from the fiber, and its use by the textile trade is being advocated. The present production is estimated at approximately \$81.57 per ton delivered at a European port. The market value of the fiber is approximately \$110 per ton.

The identity of fiber Agaves, L. H. DEWEY (*West Indian Bul.* 16 (1917), Vol. 2, pp. 104-111).—In a paper presented before the Fiber Congress held at Havana in July, 1911, and here published for the first time, the author briefly describes the 16 principal species of Agave producing commercial fibers, together with synonyms and references to other names which are confused with fiber-producing plants.

Agave to the Sisalanæ in the West Indies, with brief descriptions of *A. fourcroyana* and *A. sisalana*, is reproduced from the work of Trelease, previously published (*E. S. R.*, 30, p. 526).

Alfalfa management, B. F. SHEEHAN (*Iowa Agr.*, 18 (1917), No. 3, pp. 114, 115, pls. 139, figs. 2).—Replies to inquiries made of a large number of Iowa farmers by the Iowa Experiment Station regarding the production of alfalfa have been compiled and analyzed.

Reports from 367 individuals using a nurse crop showed an average yield of 1.6 tons of hay per acre, as compared with 3.6 tons reported by 603 who seeded without a nurse crop. The failures reported amounted to 17.2 per cent without a nurse crop and 23.4 per cent with a nurse crop. Cutting the nurse crop for hay resulted in an average yield of 3.9 tons of alfalfa for 106 farmers, and where the nurse crop was allowed to mature 3.2 tons. Failures were reported by 10.3 per cent of those who cut the nurse crop for hay, while 21.4 per cent reported failures when cutting the nurse crop for grain. An early-maturing variety of oats, such as Kherson, seeded at the rate of 1.5 or 2 bu. per acre, is recommended for use as a nurse crop.

Attempts to thicken the stand by reseeding without plowing up the field were not successful where the seed was drilled in. Cultivation to control crabgrass, annual or bluegrass was followed by average yields of 3.9 tons for 234 individuals who employed disk harrows and 3.8 tons for 44 who used either spring-tooth or spike-tooth harrows, while 653 farmers giving no cultivation averaged

3.4 tons. The spring-tooth harrow is recommended for Iowa conditions with cultivation after the removal of the second or third cuttings.

An average yield of 4 tons per acre was reported by 70 farmers using lime, this being 0.6 ton per acre more than the average yield secured by the 146 farmers who did not apply lime. With applications of lime before seeding the yields averaged 0.2 ton more than in applications after seeding. The heavy drift, southern Iowa loess, and the Mississippi loess soils are deemed most likely to be acid.

Manuring the soil before seeding to alfalfa yielded an average of 3.9 tons per acre for 728 farmers, as compared with 3.4 tons for 502 individuals who did not apply manure. Failures were reported by 14 per cent of those applying manure and by 18.1 per cent of those not applying it.

An average yield of 3.9 tons was secured from 147 seedlings on tiled land while 3.6 tons was obtained from 795 seedlings on land not tiled. There were 16.3 per cent failures reported on the tiled ground and 18.8 per cent on the untiled. Higher average yields were secured on the tile-drained fields in the soil areas.

Cassava experiments, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 1, pp. 18-20).—Tests with 11 varieties of cassava in 1915 reported, the Manioc Sellier variety being first with an estimated average yield of 10.16 tons and Mata Lotera last with 2.62 tons. A comparison of plants grown from top, bottom, and middle portions of the sticks resulted in uniformly higher yields with the middle portions of the three varieties used. For planting compared with planting in forked holes 2 ft. square and on bare ground showed no advantage for the last two methods over the former. Cassava planted with pigeon peas and cotton proved a failure both in the yield of cassava and of the other crops.

The influence of soil temperature upon seedling corn, B. D. HALSTED and S. A. WAKSMAN (*Soil Sci.*, 3 (1917), No. 4, pp. 393-398).—Two comparable lots of corn were subjected to different soil temperatures in a greenhouse, namely the warmth of the seed bed in midsummer, from July 30 to August 26, and the comparatively cool conditions of the same bed from October 29 to November 29 before the fire was started. The soil temperatures were taken at 6 a. m. and 6 p. m., and showed daily averages of 25.68 and 12.83° C. (78.2 and 55.1° F.) for the summer and autumn series, respectively.

The tests involved the factors of texture and size of grain, obtained by the selection of the crosses that carried both starchy and sugary grains on the same ear. The shelled corn was assorted into starchy and sugary grains, and these in turn were separated into the larger and smaller kernels, all defective kernels being discarded. The following sets of grains were planted in duplicate for each series, all units having 250 kernels: Starchy larger, starchy smaller, sugary larger, and sugary smaller. Tabulated data are presented showing the relationship to texture and size of grain, or to soil temperature and texture and size of grain of the following factors: Weight of seed, viability, mesocotyl length, emergence, length of plant, weight of seedlings, vigor of seedlings, and variability in length of seedlings. The observations are briefly summarized as follows:

The environmental factor of soil temperature is regarded as a controlling one in the growth of seedling corn. Starchy grains of the same ears were 27 per cent larger than sugary grains, 51 per cent more viable, and emerged nearly one day sooner, showing 25 per cent more vigor and 26 per cent less variability. The larger grains of the same ears weighed 29 per cent more than the selected smaller grains, were only 4 per cent more viable, emerged more slowly than

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ears showed 7 per cent more vigor, and nearly the same variability as smaller ears of the same texture.

The tests suggest that in somewhat favorable conditions for seedlings there may be a practical method of eliminating the weaker ones, thus leaving only those that will give better final results than when all plants from a lot of seed are grown under highly stimulating conditions. This results in a method of selection, and an application to crop growing of the general law of the survival of the fittest. Any conditions of the seed bed that tend to show the degree of vigor of the seedlings are deemed essential in the viral test, and there is possibility that a lack of either heat, moisture, or light, the leading physical environmental factors, may give the desired result. With such small seeds as those of tomato, eggplant, pepper, etc., a lack of high soil fertility may also be a factor.

Inheritance of a mosaic pericarp pattern color of maize, H. K. HAYES *Genetics*, 2 (1917), No. 3, pp. 261-281, pl. 1, fig. 1.—The author describes experiments with a mosaic pericarp pattern color of maize to study the behavior of this character in continued selection of plus and minus variates this character having exhibited a high degree of variability. The subspecies *Zea mays* *durum*, known as "brindle flint," was used but did not prove to be homozygous for the character from which it takes its name; consequently, attempts were made to produce homozygous races by self-fertilization. From 1909 to 1914 the work was conducted at the Connecticut Experiment Station and in 1915 at the Minnesota Experiment Station.

Selection experiments have isolated the following types which breed comparatively true: (1) Self-red pericarp, (2) pure for variegation but with a great variability from ears with only a few seeds with deep red stripes to ears in which nearly all seeds are quite heavily covered with red striations, (3) a very slight pattern color which under the microscope appears to be due to the presence of a faint color in some of the pericarp cells, and (4) an isolated pericarp race. Selection within the second type has not succeeded in isolating strains which breed true for the amount of variegation, extreme plus types tending to give progeny containing more ears of the minus type than are obtained from extreme plus types. Heavily striated, self-fertilized ears proved to be heterozygous, giving a progeny which segregates for one half difference. The very deeply variegated, heterozygous, self-fertilized ears produced progeny having a greater proportion of variegated segregates deeply variegated than was obtained in the progeny of less deeply variegated, self-fertilized, heterozygous ears.

Crosses are reported with the homozygous types noted above and the results obtained may be briefly summarized as follows: A cross between the self-red selection and the homozygous variegated type gave an intermediate F_1 having more deeply striated than the homozygous variegated race. The F_1 grown from self-fertilized F_1 ears showed a segregation of self-red, F_1 , and homozygous types as expected, for one unit factor difference. Back crosses of the F_1 with parental strains gave parental and F_1 types in a 1:1 ratio.

A cross between the self-red selection and pattern selection showed a dominance of the self-red type in F_1 , and in F_2 a segregation of self-red and pattern types in a 3:1 ratio.

A cross between the homozygous variegated selection and the pattern selection gave increased variability in F_1 , shown by ears of a higher grade in variegation than the parental variegated race and by the production of a considerable proportion of bud sport ears. In the F_2 some self-red ears were obtained. Pattern ears bore the proportion to other grades of 1:2.3.

A cross between the homozygous variegated race and the colorless race gave F₁ ears of the variegated type, with a segregation in F₂. One ear higher in grade than the F₁ and several ears of the pattern type were obtained, together with a number of ears of the two parental types.

The author concludes that the types for pericarp color were self-red, variegated, pattern, and colorless, and that all but the variegated selections were homozygous for these characters. The failure of the variegated selections to be homozygous in respect to the range of variation is explained by an hypothesis of slight germinal variations. From a study of the relation of these various pericarp characters in crosses between the various homozygous types, it is suggested that certain combinations produce germinal instability, and the conclusion is arrived at that the factors for self-red, variegated, pattern, and colorless pericarp form a series of multiple allelomorphs.

The relation of cob to other ear characters in corn. A. E. GRANTHAM (*U. S. Amer. Soc. Agron.*, 9 (1917), No. 5, pp. 201-217, pl. 1).—A statistical study of certain correlations existing between the cob and other ear characters is reported, as conducted at the Delaware Experiment Station from 1910 to 1915. The data were obtained from 3,500 ears in investigations made to determine the relation between the physical characters of ears to the vigor and yield of the plant. The conclusions arrived at may be briefly summarized as follows:

The yield of grain per ear is strongly correlated with circumference of ear. Practically no correlation exists between weight of individual kernels and circumference of cob. Depth of kernel and thickness of kernel are correlated to a moderate degree with cobs of small circumference. Yield of grain per ear is correlated to a considerable degree with weight of cob. Weight of cob is moderately correlated with cobs of low weight. A very low correlation exists between depth of kernel and weight of cob, the heaviest cobs not carrying the deepest kernels. A fair degree of correlation exists between thickness of kernel and cobs of low weight. Yield of grain per ear has a very slight correlation with low density of cob. A moderate degree of correlation exists between weight of kernel and cobs of low density. Depth of kernel is slightly correlated with density of cob. The correlation between thickness of kernel and density of cob is very low and negative. The coefficient of variability is much higher for weight and density of cob and weight of kernel than for the other characters.

Variety tests of corn. R. Y. WINTERS and J. H. HALL, JR. (*Bul. N. C. Dept. Agr.*, 38 (1917), No. 2, pp. 3-23, figs. 2).—Tabulated data are presented showing the results of tests with 42 varieties of corn at six experimental centers in North Carolina, giving the yields for 1916 and average yields for 1914, 1915, and 1916, inclusive. Additional data show the relative value for silage of a number of the varieties tested at five centers. The older varieties Marlboro, Biggs Seven-Ear, Weekley Improved, and Cocke Prolific are reported as giving good results, while promising new varieties which have only been tested a few years include Latham Double, First Generation Cross No. 182, and Java Golden Prolific.

Salting soft corn. H. D. HUGHES (*Iowa Sta. Circ.* 41 (1917), pp. 7).—Tests of salting down corn of varying degrees of maturity indicated that the salt was of considerable value in retarding fermentation and the development of molds and in reducing heating in soft corn. In cribbing soft corn from 0.5 to 1.5% of salt per 100 lbs. of soft corn may be used to advantage, the amount depending somewhat upon the condition of the corn. The necessity of adequate ventilation of corn stored in the crib is indicated.

On the inheritance of the number of teeth in the bracts of *Gossypium*. S. C. HARLAND (*West Indian Bul.*, 16 (1917), No. 2, pp. 111-120, figs. 4).—General notes are given on bract teeth in cotton, and observations of the first genera-

of certain crosses between types of cotton differing in the number of bract teeth are reported.

Frequency polygons of such different forms as Sea Island, St. Croix Native, Grand, and Cauto implied differences in gametic composition in respect to the character of bract teeth. The F_1 generation of two crosses, involving types differing in the number of bract teeth, showed complete dominance of the larger number of teeth, while the F_2 generation from a third cross exhibited an intermediate character, having a larger number of teeth than either parent. Since certain types are known to have bracts entirely free from teeth, it is deemed possible to secure at least six homozygous types differing considerably in the number of teeth, and consequently at least three factors may be involved in determining the tooth character of a type possessing the highest number.

Inheritance of oil in cotton, E. P. HUMBERT (*Science, n. ser., 45 (1917), No. 1169, p. 507*).—Ether extractions of the seed from seven mother plants are presented, giving the oil percentages. This is followed by an analysis of the seed of the progeny plants for three progeny years, to show the possibility of producing different strains or biotypes from a "variety" of cotton, the one having a relatively high oil content and the other a relatively low oil content.

The three "high" parents showed an average of 19.51 per cent oil and their 9 progeny an average of 20.72 per cent. The four "low" parents had an average of 17.80 per cent oil and their 12 progeny an average of 18.2 per cent. The maximum differences between the parent plants and between the progeny plants were 4.46 and 4.94 per cent of oil, respectively. Seasonal variations raising the content of all progeny plants are noted.

Cotton varieties in Georgia.—Variation of the oil content of cottonseed and resistance to disease, L. E. RAST (*Bul. Ga. State Col. Agr., No. 121 (1917), pp. 36, figs. 12; abs. in Science, n. ser., 45 (1917), No. 1169, pp. 507, 508*).—A number of variety tests in different parts of the State are reported, with special reference to early maturity and disease resistance. Toole appeared best adapted to conditions in the southern portion of the State, while College No. 1, Trice, Cook, Hooper, Sunbeam, Cleveland Big Boll, Texas Bur, Culpepper, Caldwell, Meadow, Brown No. 2, Williams, and Lankford are deemed best for northern conditions from the standpoint of earliness. In testing varieties for resistance to anthracnose it was observed that the disease affected both small and practically mature plants, although the greatest injury occurred to the bolls just before they opened.

Three years' observations of the oil content of the seed of different varieties resulted in the conclusion that marked differences exist between varieties in this respect, these differences remaining fairly constant, and being transmitted from generation to generation. The varieties showing the highest oil content when grown on the college farm for a 3-year period were Rexall, Hite, Willet Perfect, Cook, and Willet Ideal, with 23.3, 22.55, 22.38, 21.94, and 21.78 per cent, respectively. Lankford and Caldwell, with oil contents of 18.88 and 19.93 per cent, respectively, were lowest. Marked variations were also found to exist in the oil content of seed from different plants of the same variety.

History, development, and botanical relationship of Egyptian cottons, G. C. DUDGEON (*Min. Agr. Egypt, Agr. Prod. No. 3a (1916), pp. VIII+77, pls. 12*).—An extended historical and botanical study of Egyptian cottons is presented, with tables showing the areas, yields, and average prices for cotton from 1850 to 1916, and the distribution of varieties from 1905 to 1916 by area and percentage of total area. A bibliography of 71 titles is appended, comprising the literature cited.

Results of fertilizing experiments with cotton at the Clemson College station, T. E. KERR (*South Carolina Sta. Bul. 191 (1917), pp. 8-11*).—In a con-

tinuation of work previously noted (E. S. R., 21, p. 428), this reports the results of fertilizer tests with cotton grown continuously on a Cecil sandy loam soil in the upper Piedmont section of South Carolina, including tests of individual fertilizer ingredients, mixed fertilizers, lime, and manure. Crop yields for each treatment for each year of the nine years 1906-1915 are tabulated and discussed. Additional tests of various fertilizer formulas for the period of 1912-1915 inclusive, are noted.

It is concluded that heavy fertilization is required to maintain high yields of cotton on this soil and that the average of one-third of a bale per acre had not been maintained on the unfertilized plats during the last years of the experiment. Acid phosphate and manure maintained high yields throughout the test, phosphorus apparently being the principal limiting factor with nitrogen a close second. Potash increased yields sufficiently to pay the cost of the fertilizer at pre-war prices but can not now be used profitably. Manure supplemented with phosphorus resulted in an increased yield of seed cotton of 88 lbs. per bale of manure used.

In comparing the value of applications of two sources of plant food it was noted that with phosphoric acid and nitrogen the yield was 25 lbs. less than with a complete fertilizer, with phosphoric acid and potash 342 lbs. less, and with nitrogen and potash 539 lbs. less. Lime could not be applied profitably.

A fertilizer containing approximately 10 per cent available phosphoric acid and nitrogen equivalent to 3 per cent of ammonia, and no potash is deemed best for cotton on this soil under present conditions.

Whole v. cut potato tubers for planting on irrigated land, I, II. L. C. ARMSTRONG and J. S. WELCH (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 5, pp. 217-230, pl. 2).—Experiments are reported regarding the size of tuber pieces to plant for the most economical production of Irish potatoes under irrigation. The work was conducted in Idaho at the Aberdeen substation from 1913 to 1916, inclusive, where 8-, 4-, and 3-oz. tubers were planted whole, halved, and quartered, and at the Gooding substation from 1914 to 1916, inclusive, using 8- to 10-oz. and 4- to 6-oz. tubers planted whole, halved, and quartered, and 2- to 3-oz. tubers planted whole and halved. Idaho Rural was used at both stations.

The average results obtained at the Aberdeen substation are tabulated below and show that although the total yield from whole tubers was 14.4 per cent more than from cut tubers, the percentage of marketable tubers from cut seed pieces was 18 per cent more than from whole seed pieces.

Results of tests with whole and cut potato tubers at Aberdeen, Idaho, 1913-1916

Kind of tuber set planted.	Stand.	Stalks per hill.	Yield per acre.		Percentage of marketable tubers.	Number of tubers per bushel.		Weight per tuber.	
			Total.	Marketable.		Marketable.	Culls.	Marketable.	Culls.
	<i>Per ct.</i>		<i>Bush.</i>	<i>Bush.</i>				<i>Oz.</i>	<i>Gr.</i>
8-oz. whole.....	99.91	8.67	392.9	200.6	52.6	209	504	4.6	1.1
8-oz. halved.....	99.97	4.71	333.5	210.5	65.2	196	439	4.9	1.1
8-oz. quartered.....	99.23	2.63	314.0	218.2	69.1	152	419	5.3	1.1
4-oz. whole.....	99.99	5.41	368.7	171.0	46.3	179	403	5.7	1.1
4-oz. halved.....	99.99	2.98	332.9	220.1	66.1	171	418	6.2	1.1
4-oz. quartered.....	99.31	1.71	322.7	250.9	77.4	152	414	4.9	1.1
3-oz. whole.....	100.00	4.82	361.7	201.1	54.2	196	417	5.9	1.1
3-oz. halved.....	98.87	2.64	355.5	253.8	68.8	162	412	5.4	1.1
3-oz. quartered.....	82.19	1.72	262.7	201.5	78.0	170	424	4.9	1.1
Whole, average.....	99.97	6.30	374.4	191.0	51.0	194	424	5.3	1.1
Halved, average.....	99.61	3.44	349.6	228.1	66.7	176	424	5.8	1.1
Quartered, average.....	86.92	2.02	299.8	223.5	71.5	158	412	5.8	1.1

The results obtained at Gooding are summarized below and are largely comparable to those secured at Aberdeen.

Results of tests with whole and cut potato tubers at Gooding, Idaho, 1914-1916.

Size and portion of tuber planted.	Number of stalks per hill.	Number of tubers per hill.	Average weight of tubers.	Total weight of tubers per hill.	Total weight of marketable tubers per hill.	Percentage of tubers marketable.
			Oz.	Lbs.	Lbs.	
4 to 14 oz., whole.....	8.9	22.7	2.6	3.67	2.28	62.12
4 to 14 oz., halved.....	5.6	17.2	3.5	3.76	2.90	77.12
4 to 14 oz., quartered.....	2.9	12.5	4.3	3.36	2.65	78.87
4 to 6 oz., whole.....	7.4	20.8	2.8	3.56	2.33	65.45
4 to 6 oz., halved.....	4.0	15.0	3.5	3.33	2.50	75.05
4 to 6 oz., quartered.....	2.3	12.0	3.8	2.85	2.23	78.25
2 to 4 oz., whole.....	5.2	16.4	3.2	3.25	2.24	68.90
2 to 4 oz., halved.....	2.8	12.4	4.0	3.11	2.41	77.49

[Chilled v. unchilled potato seed for fall planting], L. FOUR (*Univ. Ark. Agr. Ext. Circ.* 38 (1917), pp. 4, fig. 1).—The results of a field test with chilled and unchilled seed potatoes from the spring planting used for the fall crop immediately following showed an estimated acre yield for the chilled seed of 17.88 bu. as compared with 0.62 bu. per acre from the unchilled seed.

Proceedings of the third annual meeting of the Potato Association of America (*Proc. Potato Assoc. Amer.*, 3 (1916), pp. 16-83).—The following papers were read and discussed: Grading Potatoes for Market, by H. R. Talmage; Definitions of Market Types for Seven Leading Varieties of Potatoes, by C. L. Fitch; Modern Methods of Potato Culture Abroad and in this Country, by L. D. Sweet; Origin, Introduction, and Primitive Culture of the Potato, by W. F. Wight; Our Present Knowledge of Potato Diseases: What They Are and How to Control Them, by H. A. Edson; Discussion of Potato Seed Certification, by M. F. Barrus; Potato Utilization Possibilities, by H. C. Gore; A Preliminary Report upon the Making of Potato Silage for Cattle Feed, by L. A. Round and H. C. Gore; and The Value of Potatoes in Swine Feeding, by F. G. Ashbrook.

[Potatoes] (*Rpt. Minn. Potato Growers' Assoc.*, 2 (1917), pp. 16-44).—The following papers were presented at the second annual meeting of the Minnesota Potato Growers Association: Degeneracy of the Potato, by R. Wellington; The Potato Industry in America, by L. D. Sweet; Potato Standardization and Marketing, by C. T. More; Potato Demonstration Work in Hennepin County, by K. A. Kirkpatrick; Potato Certification, by H. C. Stakman; Selecting Show Potatoes, by A. W. Aamodt; and A New Potato Marketing Plan, by W. A. Morse.

Comparative trials with rye grasses, E. BREAKWELL (*Agr. Gaz. N. S. Wales*, 3 (1917), No. 5, pp. 317, 318).—Comparative trials with Italian and Western-wolth rye grass at Glen Innes, Yanco, and Grafton Experiment Farms and Hawkesbury Agricultural College are briefly noted. Western-wolth rye grass is considered much superior to Italian rye grass, consistently producing a heavier and more uniform crop, and being especially well adapted to the coast and irrigated areas of New South Wales. Both grasses behave as annuals in this region.

Weight of seeds as related to their number and position in the pod, B. D. HILSTER (*Torreya*, 17 (1917), No. 6, pp. 101, 102).—The following data are presented to show the relation of the weight of soy-bean seeds to the number and position of the seeds in the pod for three varieties varying greatly in season of growth and size of seed. A total of 29,100 seeds was examined.

Weight of seeds of soy beans of various types.

Type of pod.	Early Brown.	Wilson.	Ito San.	Average.	Pct. average.
	Gm.	Gm.	Gm.	Gm.	Gm.
1-seeded.....	0.210	0.141	0.200	0.184	100
2-seeded base.....	.177	.139	.190	.169	91.8
2-seeded tip.....	.199	.142	.190	.177	96.2
3-seeded base.....	.188	.124	.167	.158	85.9
3-seeded middle.....	.209	.140	.187	.179	97.2
3-seeded tip.....	.201	.133	.187	.173	94.0
Averages.....	.197	.136	.187	.173	

The author suggests the possibility of obtaining from persons in widely separated regions valuable contributions to a knowledge of the seed weights of wild plants bearing their seeds in pods.

Sudan grass, T. H. LOUGHER (*Estac. Expt. Agron. Cuba Bol. 30 (1916), pp. 19, pls. 6*).—The introduction of Sudan grass into Cuba is briefly noted and the production of the crop for hay and seed discussed.

Experiments with the sugar beet in South Africa, C. F. JURITZ (*African Jour. Sci., 13 (1916), No. 4, pp. 167-177*).—Field tests with sugar beets and mangels conducted subsequent to those previously noted (*E. S. R., 20, p. 432*) are briefly reported. Analyses of sugar beets grown during 1911 and 1912 showed a variation of from 3.04 to 17.46 per cent of sugar, depending upon the maturity of the roots.

Regarding successful mangel production as an index to the possibilities of sugar-beet growing, the author presents analyses of five varieties of mangels grown during 1913 and 1914.

Four varieties of sugar beets were tested by E. T. L. Edmeades during 1915-16 with the average total sugar content varying from 15.89 to 18.43 per cent. An analysis of the external portion of the average beets of each variety to a thickness of approximately 1 in. showed a slightly higher percentage of sugar over the remaining portion of the root. Comparative analyses of roots under the average with those over the average sustained the generally accepted view that small beets contain more sugar than large ones of the same class.

An increase in the sucrose content of sugar beets after their removal from the soil, F. G. WEICHMANN (*Sugar [Chicago], 19 (1917), No. 6, pp. 220-224*).—While engaged in the study and development of a process for obtaining sugar beet cossettes capable of being stored for a long period without suffering decay or material deterioration, the author found that the processed cossettes contained more sucrose than was evidenced by the analysis of the fresh sugar beets. Experiments are reported in an effort to study this phenomenon and to discover a means for the practical application of the results obtained. A method of analysis of dehydrated cossettes based on the International method of hot-water digestion (*E. S. R., 31, p. 315*) has been developed by the author and is fully described, and its application to the analysis of fresh sugar beets and dehydrated cossettes is discussed.

It is concluded that the transformation of reserve food products in the cells of the sugar beet shows an enzymatic action, while a close parallelism was observed between the manner of action of enzymes and of inorganic catalysts. In both agents was noted a selective action, the prime importance of temperature conditions, the necessity of optimum moisture conditions, and the reversibility of the reactions. Preliminary experiments indicated that a temperature range of from 40 to 50° C. was more favorable for an increase of sucrose than

other temperatures. Further investigations are to be made to determine the optimum temperature conditions.

The sugar beet seed industry in France, L. MALPEAUX (*Vie Agr. et Rurale*, 1917), No. 19, pp. 332-337).—The commercial production of sugar beet seed is discussed, and selection based on chemical and genealogical analyses, and selection on the farm outlined.

It is estimated that the cost of production would approximate \$77.73 per acre, and that with a yield of 1,780 lbs. per acre the cost of production of the seed would be approximately 4.36 cts. per pound.

Sugar cane experiments, 1914-16, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 1, pp. 1-14).—Extensive cane variety tests are reported for four experimental centers, with tabulated data on acre yields and percentage and general composition of the juice.

Experiments are reported in which the top, the center, and the bottom portions of the cane were compared to ascertain their relative value for sugar production. Ripe canes of B. 156 were employed and were cut and topped in the usual manner. The upper 10 or 12 in., containing 3 or 4 joints, was cut off, and the remaining portion cut into two equal lengths. The percentage of juice extracted amounted to 54.6 for the tops, 65.2 for the centers, and 67.4 for the bottoms, with sucrose contents of 7.52, 17.93, and 17.76 per cent, respectively.

(Report of sugar cane work in Hawaii), H. P. AGEE, G. F. RENTON, J. T. AGEE, and J. HIND (*Hawaii Sugar Planters' Sta., Proc.*, 36 (1916), pp. 13-124, 4 pl. figs. 4).—The following reports, dealing with field tests with sugar cane, were read and discussed before the thirty-sixth annual meeting of the Hawaiian Sugar Planters' Association: Report of the Director of the Experiment Station, Report of the Committee on Cultivation, Fertilization, and Irrigation of Irrigated Plantations, Report of the Committee on Cultivation and Fertilization of Unirrigated Plantations, and the Report of the Committee on Cutting, Loading, and General Transportation.

Cuban varieties of sweet potatoes, J. T. ROIG and G. M. FORTUN (*Estac. Agr. Agron. Cuba Bol.* 33 (1916), pp. 76, pls. 32, fig. 1).—Forty-seven types of sweet potatoes found in Cuba are listed, classified as white, yellow, violet, and red, and briefly described. The cultural practices involved in sweet potato growing are described and the uses of the crop and its importance in Cuban agriculture discussed. Insects and diseases attacking the crop are noted.

The comparative efficiency of indexes of density, and a new coefficient for measuring square-headedness in wheat, S. BOSHNAKIAN (*Jour. Amer. Soc. Agron.* 9 (1917), No. 5, pp. 231-247, pl. 1, figs. 5).—The comparative efficiency of the indexes of density now in use are analyzed and a new coefficient presented as a substitute for the present methods of measuring compactness, which would show the differences between the three types of compact wheats, namely, the squarehead, *Triticum capitatum*, the club, *T. compactum*, and squareheaded-club, *T. compacto-capitatum*. An instrument for determining the density or squarehead coefficient of large numbers of heads, and which simultaneously divides the rachis into three equal parts, registers the length of the rachis, and registers the third of the length of the rachis, is described and illustrated as designed by the author and constructed by the Office of Cereal Investigations of the U. S. Department of Agriculture.

Four of the older formulas are compared, including those of Derlitzki and Gerguard, with reference to their application in measuring different types of wheat heads and to determine the experimental errors involved in their operation. The author concludes that of the formulas given "the average internode

length represents the best method for determining density, as density is dependent directly upon the length of the rachis and the number of its internodes, of which it is composed." As square-headedness results from the shortening of the terminal internodes, it was found that the ratio between the number of internodes in the middle third of the rachis and the number in the upper third would best express the degree of square-headedness. The coefficient of square-headedness is found, therefore, by the formula $Sq = \frac{I_1}{I_2}$, where I_1 is the number of internodes in the terminal third of the rachis and I_2 the number in the middle third.

Influence of environment on the color of the wheat grain. G. L. KORTY (Poona Agr. Col. Mag., 8 (1917), No. 3, pp. 183-185).—A study of environmental influences on the color of white wheats in the Bombay Presidency, India, led the author to conclude that while such influences can result in discoloration of the grain the effect was neither permanent nor progressive.

Wheat and its products. A. MILLAR (London and New York: Sir Isaac Pitman & Sons, Ltd., 1916, pp. X+134, pls. 3, figs. 36).—This contribution to the man's Common Commodities of Commerce series, contains a brief account of wheat and its products, with regard to its habitat, transportation, and the modern methods of producing wheat flour.

The moisture content of heating wheat. C. H. BAILEY (Jour. Amer. Agron., 9 (1917), No. 5, pp. 248-251).—Moisture and other data are presented which were secured from an examination of heating spring wheat received at Minneapolis and sampled during the 14 days from August 3 to 16, 1916, under unusual temperature conditions. The mean maximum daily temperatures in July and August, 1916, at Minneapolis were 88.3 and 81.7° F., respectively, as compared with 75.5 and 75°, respectively, for the same months in 1915. The determinations were made at the Minnesota Grain Inspection Department Laboratory.

The data indicate that the moisture content of sound, plump, spring wheat must be above the normal (about 13.75 per cent) before heating ensues, even under such extreme temperature conditions as those of 1916. Of two samples of heating wheat examined, containing less than 14 per cent of moisture, one was frosted and the other shriveled. All samples containing less than 14.3 per cent of moisture were shriveled, with low weight per bushel, indicating a tendency of such grain to heat. The author concludes that sound, plump, hard wheat containing less than 14.5 per cent of moisture will keep without heating in storage in a temperate climate, while a lower moisture limit must be employed in storing shriveled and frosted wheat, and possibly with sound, plump wheat in tropical climates.

Yucca. R. S. CUNLIFFE (Estac. Expt. Agron. Cuba Bol. 34 (1916), pp. 66, pl. 22, fig. 1).—Cultural practices employed in yucca growing in Cuba are given in detail, and its uses as human and stock food and for starch production are discussed. Brief descriptions are given of 54 varieties, together with their chemical analyses. Insects and diseases attacking the crop are noted.

Montaña grain inspection and the Federal grain standards for wheat. A. ATKINSON (Montana Sta. Circ. 68 (1917), pp. 14).—This circular gives the rules and regulations governing the taking of samples of grain for grading at the Montana grain inspection laboratory and the Federal standards for wheat as announced by the Secretary of Agriculture. That part of the text of the Montana State grain-inspection law applying to the above is included.

[Report of seed testing and experimental work at Oberlikon, Zurich]. F. G. STEBLER, A. VOLKART, and A. GRISCH (Schweiz. Samen Unters. u. Verh.

est. *Perlikow-Zurich, Jahresber.*, 39 (1915-16), pp. 34; *Landw. Jahrb. Schweiz*, (1916), No. 1, pp. 1-28; 31 (1917), No. 2, pp. 268-301).—The results of seed examinations for 1914-15 and 1915-16 are reported. The average percentage of purity, germinability, and availability is given for samples of seeds of clover, vetches, annual and perennial fodder plants, other legumes, grains, fiber plants, and other vegetables, and trees.

General notes are given on cultural experiments in progress at Zurich.

Weed seeds and impurities in imported seed, E. BREAKWELL (*Agr. Gaz. N. S. Wales*, 28 (1917), No. 6, pp. 405-408).—A tabulated list of the weed seeds found in 1,000 official samples of agricultural and vegetable seed imported into New South Wales since July 1, 1916, is presented. The percentage of weeds in the samples varied from a trace to 12 per cent.

Solanum rostratum.—A new weed plant, T. G. B. OSBORN (*Jour. Dept. Agr. South Australia*, 20 (1917), No. 10, pp. 783, 784, fig. 1).—The first occurrence of *S. rostratum* in South Australia is recorded and the plant briefly described.

HORTICULTURE.

Commercial plant propagation, A. C. HOTTES (*New York: A. T. De La Rue Co., Inc.*, 1918, pp. 180, figs. 106).—An exposition of the art and science of increasing plants as practiced by the nurseryman, florist, and gardener. Opening chapters deal with propagation by means of seeds, cuttings, bulbs, and divisions, and graftage. Directions are then given for propagating seeds for various fruits, certain commercial florist's plants, herbaceous perennials, annuals, bulbous plants, trees, and shrubs. The book concludes with a general list of books on plant propagation.

Observations on the color of seeds originating from spontaneous crossing between two forms of *Phaseolus vulgaris*, J. F. LUNDBERG and Å. ÅKERMAN (*Svensk Utsädesför. Tidskr.*, 27 (1917), No. 3, pp. 115-121).—A study of color inheritance in the progeny of crosses between two kinds of brown beans is noted.

The common bean (*Phaseolus vulgaris*), H. COMES (*Bol. Agr. [Sao Paulo]*, 1917, Nos. 9, pp. 712-726; 10, pp. 793-807; 11, pp. 928-947).—An account of the common bean (*P. vulgaris*) with reference to its history, phylogenesis, and supposed toxicity of certain forms.

Observations on the eight-year experimental culture of kitchen vegetables in peat soil rich in nitrogen near Torestorp, H. VON FEILITZEN (*Svensk Moss-odling. Tidskr.*, 31 (1917), No. 4-5, pp. 364-386, figs. 19).—Experiments were conducted with most of the common vegetables for a number of years. The results, as a whole, indicate that good results may be obtained on peat soil if it is well fertilized and properly cultivated. The soil used in the work contained a low content in potash and phosphoric acid.

The principles and practice of pruning, M. G. KAINS (*New York: Orange Judd Co.*, 1917, pp. XXV+420, figs. 325).—A treatise on pruning embodying the best results secured in investigations by experiment station workers and others in this country and abroad. The successive chapters discuss plant physiology as related to pruning, the philosophy of pruning, buds, pruning principles, how wounds heal, prevention and repair of mechanical injuries, dressings to wounds, pruning nursery stock, pruning young trees, pruning mature trees, and top-worked trees, bush fruit pruning, grape pruning and training, pruning ornamental trees and shrubs, dwarf tree pruning and training, odd methods of pruning and training, practical tree surgery, and rejuvenation of neglected trees.

References to the literature of cited investigations are included.

The question of "bulk" pruning, V. R. GARDNER (*Fruit World Austral.*, 19 (1918), No. 1, pp. 2-4, 6, 7).—In this paper, which was read before the American Pomological Society, the author analyzes the types of pruning generally employed, and presents evidence to show that the radius of influence within the tree of any pruning (i. e., the cutting out or cutting back of any particular shoot or branch) is comparatively narrow. Roughly speaking, the only parts of the tree to show response to pruning are those close to the pruning wound and close to the space left by the removal of a branch. The author concludes a substance that if the pruning that is to be afforded orchard trees is to be such as will help establish and maintain rather than disturb a proper balance between vegetative and fruiting wood, all parts of the tree should be pruned annually and the pruning should be limited to the shoots, spurs, and smaller branches.

Report of the director of fruit culture, A. H. BENSON (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1916-17, pp. 64-71, pl. 1*).—A review of the present status of the fruit and vegetable industries in Queensland, including tabular data showing the exports and imports of fruits and vegetables for the year ended June 30, 1917.

Sixteenth report of the Woburn Experimental Fruit Farm, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt., 16 (1917), pp. 73 fig. 1*).—In continuation of previous reports dealing with fruit investigations conducted at the Woburn Experimental Farm (E. S. R., 35, p. 37; 36, p. 140) this report embodies the results of a large mass of observations made of the behavior of apple and other fruit trees, gooseberries, currants, raspberries, and strawberries under different manurial treatment since the farm was established in 1894. Comparative data are also given for potatoes and onions. The results secured are summarized in a series of tables and discussed at length. Data on the work previous to 1904 have been published in a previous report (E. S. R., 16, p. 872).

Summarizing the results of the fertilizer investigations as a whole, it appears that farm crops, such as potatoes and onions, have responded favorably to manurial treatment and there has been very little difference between the results from artificial manure and dung. Apples grown in similar soil have not responded favorably to manurial dressings of any kind. The application of manures to strawberries increased the yield of fruit by only 12 or at most 15 per cent above that from plants receiving no manure at all. On the other hand, the authors conclude that it would be madness to attempt to grow gooseberries or other bush fruits without a liberal supply of dung. Artificial manures have not proved an efficient substitute for dung and under the conditions of the experiment their use in addition to dung has produced no good results.

Report on the statistics of vineyards, orchards, and gardens, and root crops for the season 1916-17, W. L. JOHNSTON (*So. Aust. Statis. Dept. Bul. 3 (1917), pp. 4*).—Statistics on the area, production, and value for the year 1916-17, together with comparative data for the four previous seasons.

Dusting v. spraying, L. CAESAR (*Canad. Hort., 41 (1918), No. 2, pp. 21, 22 fig. 1*).—A comparative test of dust and liquid sprays conducted in 1916 and in 1917 in the Niagara district of Ontario indicates that the dust spray gave almost as good results as the liquid spray, both with apple scab and the codling moth. The cost of the two methods for large trees was about the same, but for small trees spraying was much cheaper. Although the author succeeded in controlling the San José scale on 48 large trees with a special dust sold for this purpose, it is believed that to do satisfactory work the dust must be ground much finer or must be applied just after a shower.

The author used dust with very satisfactory results on sweet and sour cherries as a means of preventing rot during the picking season. The dust applied was composed solely of sulphur and ground talc without any poison. The fruit and foliage of these orchards had been kept covered by lime-sulphur and arsenate of lead during the earlier part of the season.

Dusting successfully controlled powdery mildew on red varieties of grapes without burning the foliage.

See also a previous note (E. S. R., 37, p. 832).

Applying sprays for best results, G. E. SANDERS (*Canad. Hort.*, 41 (1918), No. 2, pp. 23, 24, fig. 1).—An extract from an address on this subject delivered at the annual convention of the Nova Scotia Fruit Growers' Association, and based upon experimental work conducted in Nova Scotia under the direction of the author in 1916 and 1917.

Helpful hints on dusting peaches, W. W. CHASE (*Ga. Bd. Ent. Circ.* 24 (1918), pp. 7).—This circular contains directions for the use of dusting machines in applying dust mixtures for the control of brown rot, peach scab, and, to some extent, curculio.

The why of the "June drop" of fruit, A. J. HEINICKE (*Cornell Countryman*, 15 (1918), No. 5, pp. 267, 268, 292, 294, 296, figs. 3).—A popular discussion of the factors influencing the set of fruit, with special reference to apples.

California's grape industry, C. J. WETMORE ET AL. (*Cal. Bd. Vit. Comrs. Bul.* 15 (1918), pp. 30).—A statistical review of the California grape industry for the season of 1917, including data on present viticultural activities and suggestions dealing with the preservation and future development of the grape industry.

Where and how to grow avocados, W. POPENOE and E. SIMMONDS (*Fla. Grower*, 17 (1918), No. 7, pp. 7-10, 16, 17, 23-26, figs. 8).—This article contains detailed instructions for growing avocados in southern California and southern Florida, together with a descriptive list of varieties.

The native bananas of the Hawaiian Islands, V. MACCAUGHEY (*Plant World*, 21 (1918), No. 1, pp. 1-12).—This paper briefly considers some of the introduced bananas and discusses somewhat in detail the native varieties.

Better California grapefruit, A. D. SHAMEL (*Cal. Citrogr.*, 3 (1918), No. 5, pp. 94, 115, 116, figs. 4).—A progress report on work conducted during 1917 for the improvement of grapefruit by top-working inferior or worthless trees with buds from superior trees. The present work is based upon methods used in bud-selection experiments in California citrus groves (E. S. R., 37, p. 144).

Relation of soil moisture to orange growth, C. A. JENSEN (*Cal. Citrogr.*, 3 (1918), No. 5, pp. 98, 113, fig. 1).—This paper presents some of the results of soil-moisture experiments with oranges conducted at Riverside and Merryman, Cal., and at Phoenix, Ariz., during the past summer.

The data here presented indicate that there is a close correlation between the growth of orange trees and the amount of available soil moisture present from week to week, an increase in soil moisture producing an almost immediate increase in orange growth. The orange is likewise sensitive to humidity in the air, and in the presence of a relatively high humidity will make considerable growth even when the percentage of available soil moisture is low.

The orange trees obtained no appreciable amount of moisture from soil below 4 ft., thus indicating that it is a waste of water to apply more than is necessary to keep the deeper subsoil up to its moisture-holding capacity. The movement of the soil moisture upward from the deeper subsoil is entirely too slow to supply the roots in the main feeding-soil area with enough moisture to satisfy the normal needs of the tree after the first 3 ft. of soil has been

exhausted of available moisture. The author points out that it requires comparatively little irrigation water to maintain available moisture in the top subsoil; that an excess of water in the subsoil, when the drainage is poor, is likely to result in root rot; and that excessive water in a porous subsoil undoubtedly carries down much plant food beyond the reach of the feeding roots.

Papaws, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916-17, p. 25*).—A brief account of preliminary work undertaken at the Besserrat experiment station with a view to securing a type of papaw with a high papain content.

Proper place of nut trees in the planting program, C. A. REED (*Amer. Agr. Jour., 8 (1918), Nos. 1, p. 5; 2, pp. 20, 21*).—The author briefly discusses the climatic limitations of cultivated and native nut species in the United States, calls attention to the lack of nut varieties for the section of country east of the Rocky Mountains and north of the pecan belt, and advocates the extensive planting of seedling nut trees along the national highways as a means of furnishing ample material from which to select improved varieties for orchard planting.

Bay trees (*Pimenta acris*), F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916-17, pp. 15-18*).—Data are given on cultural experiments with bay trees during the year ended March 31, 1917, with special reference to the yield in leaves and actual amount of oil distilled. Comparative data are given for the years 1912 to 1916, inclusive.

The soil of Netherlands Indies and its use in agriculture (*Verzam. A. Handel. Grond Nederland. Indië Gebruik Landb., Bodemcong. Djokjokarta, 1916, Nos. 3, pp. 4, pls. 12; 6, pp. 4; 8, pp. 4; 13, pp. 5; 14, pp. 3; 15, pp. 26; 16, pp. 14; 17, pp. 19, pls. 3; 18, pp. 7*).—Among the papers on the above subject presented at the Netherlands Indies Soil Congress, held at Djokjokarta in October, 1916, are the following: The Principles of Cinchona Culture (No. 3), by P. Van Leersum, previously noted from another source (*E. S. R.*, 36, p. 538); Principles of Coconut Culture (No. 6), by P. E. Keuchenius; The Knowledge Relative to the Manuring of Perennial Cultures (No. 8), by A. J. Ultee; A Short Description of the Usual Methods of Preparation for Planting and Subsequent Management of Hevea Trees (No. 13), by C. M. Hamaker; The Principles of Coffee Culture (No. 14), by T. Wurth; Soil in Relation to the Forests (No. 15), by H. Beekman; Coffee Culture in the Residencies of Pasoeroean and Kediri (No. 16), by M. W. Senstius; Green Manuring (No. 17), by C. Bernard, previously noted from another source (*E. S. R.*, 38, p. 20); and Notes on the Tea Soils of Java and Sumatra (No. 18), by J. J. B. Deuss.

Rhododendrons and the various hybrids, J. G. MILLAIS (*London and New York: Longmans, Green & Co., 1917, pp. XI+268, pls. 61*).—A descriptive account of all species of the genus *Rhododendron*, including azaleas, and the various hybrids. The work is well illustrated with colored and collotype plates, together with numerous illustrations from photographs.

The introductory chapter discusses the love of gardening and gardens, with special reference to rhododendrons. The succeeding chapters deal with the general distribution of the species, Chinese rhododendrons, hybrid rhododendrons, cultivation, rhododendrons for each month of the year, and gardens where rhododendrons are a special feature. The work concludes with an alphabetical list of all known rhododendrons and their hybrids, with descriptions of all those which are generally cultivated and notes on their cultivation, history, and geographical distribution.

An introduction to the study of landscape design, H. V. HERBARD and THEODORE KIMBALL (*New York: The Macmillan Co., 1917, pp. XX+406, pls. 72 figs. 11*).—The purpose of this work is to present a general conception of land-

scape design from the standpoint of designers and also to serve as a general introduction to the subject for those whose interest in it is purely that of appreciation and enjoyment of landscape designs and natural landscapes.

The introductory chapter deals with the scope of landscape architecture and its requirements of the practitioner. The succeeding chapters discuss the theory of landscape design; taste, ideals, style, and character, in landscape design; styles of landscape design; landscape characters; landscape effects; landscape composition; natural forms of ground, rock, and water as elements in design; planting design; design of structures in relation to landscape; and types of landscape designs. Appended to the work are notes on the professional practice of landscape architecture in America, notes on procedure in design, and a selected list of references on landscape architecture.

FORESTRY.

Third biennial report of the State forester of Kentucky, 1917, J. E. BARTON (*Bun. Rpt. State Forester Ky., 3 (1917), pp. 39, pls. 6*).—A brief review of the activities of the State Board of Forestry along the lines of forestry propaganda, investigation, and protection and of work in the State nurseries and experimental forest, including a financial statement for the fiscal years 1916 and 1917.

Appended to the report are papers on Forest Taxation in the United States, by J. E. Barton (pp. 26-30), and Growing Timber for Mining Purposes, by M. H. Forester (pp. 35-39), together with a check-list of the trees in Kentucky.

Forestry, J. H. PRATT and J. S. HOLMES (*N. C. Geol. and Econ. Survey, Bienn. Rpt. State Geol., 1915-16, pp. 20-88, fig. 1*).—An account of forest activities in North Carolina during the biennial period 1915-16, dealing with forest protection; the acquisition of State and Federal forest areas; examination of forest lands, farm woodlots, and cut-over lands; reports of meetings of the North Carolina Forestry Association and the Southern Forestry Congress; forestry propaganda; and miscellaneous activities.

Progress report of the Forest Research Institute for the year 1916-17, R. E. OSMASTON (*Rpt. Forest Research Inst. [Dehra Dun], 1916-17, pp. 24*).—A report of progress made in investigations dealing with silviculture, development of forest working plans, forest botany, forest economy, forest zoology, and forest chemistry. Appended to the report are a list of forest publications issued since the creation of the Forest Research Institute and a summary of revenues and expenditures for the year.

Proceedings of the National Parks Conference (*U. S. Dept. Int., Proc. Nat. Parks Conf., 4 (1917), pp. 364*).—This comprises a report of various papers, addresses, and discussions of the Fourth National Parks Conference, held in Washington, D. C., January 2 to 6, 1917.

Farm forestry, J. H. FOSTER, F. H. MILLEN, and H. B. KRAUSZ (*Texas Agr. Col. Ext. Serv. Bul. B-42 (1917), pp. 17*).—A popular bulletin discussing the importance of farm forests, the principal woods and wood-using industries, and methods of handling and marketing woodlot products.

Plan of cooperation between woodland owners and the State forester (*Md. Bd. Forestry Leaflet 18 [1918], pp. 2*).—The plan provides to give the owners of Maryland woodlands expert advice on their management and on the valuation and sale of woodlot products.

The case for New Brunswick's forests, R. BLACK (*Canad. Forestry Assoc. [Pamphlet, 1917], pp. 9, pl. 1*).—A brief survey of New Brunswick's forest wealth, together with an appeal for a rational system of forestry and fire protective measures.

British forestry, past and future, W. SOMERVILLE (*London and New York: Humphrey Milford, [1917], pp. 19*).—In this paper the author discusses various factors tending to make British forestry unprofitable in the past, shows the present need for afforestation, and suggests methods of procedure.

Forestation practice in Norway (*Jour. Forestry, 16 (1918), No. 1, pp. 99*).—A summary of forestation practice in Norway based on Lindberg's work on the culture of pine trees in Norway (*E. S. R., 33, p. 542*).

The trees at Mount Vernon, C. S. SARGENT (*Reprint from Ann. Rpt. Mount Vernon Ladies' Assoc. of the Union, 1917, pp. 16, pl. 1*).—A record, with planting plan, of the size and condition of the trees planted by Washington near his house at Mount Vernon, and of those now standing which have been planted or have sprung up naturally in the neighborhood of the mansion since his death in 1799.

Tree growth in the vicinity of Grinnell, Iowa, H. S. CONARD (*Jour. Forestry, 16 (1918), No. 1, pp. 100-106*).—This paper presents some accurate data on tree growth in Poweshiek, Jasper, and Mahaska Counties, Iowa.

The data show in a general way that the richer upland prairie soils of Iowa are very favorable for tree growth. Growth increment is great enough for the production of timber as a crop on these soils. On the other hand, the capital value has not yet made the timber crop the equal of corn.

Oregon forest facts (*Salem, Oreg.: State Bd. Forestry, [1917], pp. 8*).—A brief review of Oregon's timber resources and what State and private activity in forest protection has accomplished.

Firewarden's handbook; Oregon forest fire laws (*Salem, Oreg.: State Bd. Forestry, 1916, pp. 48*).—This handbook indicates briefly the forest policy of the State and supplies the information needed by the State firewardens in the discharge of their duties.

Our present knowledge of the forest formations of the Isthmus of Panama, H. PITTIER (*Jour. Forestry, 16 (1918), No. 1, pp. 76-84*).—A paper on this subject read before the Biological Society of Washington, November 18, 1916. It comprises a brief account of some results of the study of the flora of Panama made in connection with a general biological survey organized by the Smithsonian Institution.

Forestry handbook.—II, Some of the principal commercial trees of New South Wales, J. H. MAIDEN (*Sydney: Govt., 1917, pp. 224, pls. 831*).—In continuation of part I of this handbook, which discussed forest principles and practice (*E. S. R., 35, p. 346*), the present part contains descriptive accounts of some of the principal commercial trees of New South Wales. The species are considered with reference to their nomenclature, distinguishing characteristics, character and use of the wood and other products, habitat, and methods of propagation. The descriptions are accompanied by plates illustrating the twigs, fruits, buds, etc., and a reference list of accessible illustrations of trees and shrubs of New South Wales forests is also included.

Probable error in field experimentation with Hevea, O. F. BISHOP, J. GRANTHAM, and M. D. KNAPP (*Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 5, pp. 335-366, fig. 1*).—This has been noted from another source (*E. S. R., 37, p. 837*).

Results of tapping experiments with Hevea brasiliensis, A. W. K. DE JONG (*Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 5, pp. 378-402*).—A summarized account of the present knowledge on the tapping of Hevea trees.

The suitability of latexometers for determining the rubber content of latex in field tests, A. A. L. RUTGERS and J. G. J. A. MAAS (*Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 3-4 (1917), pp. 1-24*).—In view of the contention supported by various writers that

latexometers often give very inaccurate figures as to the rubber content of latex, four series of experiments were conducted under estate conditions in which the percentage of rubber was measured by means of latexometers of different types and also by the dry weight of a slab coagulated from a 50 or 100 cc. sample of latex. The figures found by the latexometer measurements differed from those found by the dry-weight measurements, but the relative figures remained the same.

The authors suggest that the differences may be partly due to errors in the weight of the dry samples. The errors of the latexometer measurements are largely explained by errors in the scale and by the influence of temperature on the readings.

Thirty-seven years of spruce selection in Austria, REUSS (*Centbl. Gesam. Forstw.*, 42 (1916), No. 11-12, pp. 383-417; *abs. in Internat. Inst. Agr. [Rome], Internat. Rer. Sci. and Pract. Agr.*, 8 (1917), No. 8, pp. 1116-1118).—In continuation of selection studies reported on in 1884 the results are given in this paper of selection studies conducted to 1916. The earlier work is also summarized.

The experiments in pure selection were made with 21 classes of spruce seed taken from parent trees ranging in age from 23 to 142 years. The influence of the parent on the progeny is considered with reference to the climatic origin, i.e. growth performance, and distinguishing characteristics of the parent. The study is being continued by the Imperial Forestry Experiment Institute at MariaBrunn.

The rotation period of teak, H. BEEKMAN (*Boschbouck. Tijdschr. Tectona*, 19 (1917), No. 12, pp. 995-1044).—A paper on this subject delivered at the Forest Keepers' Congress, held at Djocja, October 17-18, 1917.

Forest terminology.—Terms used in the lumber industry (*Jour. Forestry*, 18 (1918), No. 1, pp. 1-75).—This comprises an alphabetical list of terms used in the lumber industry, prepared by a committee of the Society of American Foresters. A similar list of terms used in forestry has been noted (E. S. R., 26, p. 744).

DISEASES OF PLANTS.

The Michigan plant disease survey for 1914, G. H. COONS (*Rpt. Mich. Acad. Sci.*, 17 (1915), pp. 123-133, pls. 4).—This is a preliminary account of results obtained in a plant disease survey conducted by the department of botany of the Michigan Agricultural College in cooperation with the U. S. Department of Agriculture.

The present extent of curly dwarf and that of leaf roll of potato is outlined. The cucumber disease situation appears to be serious. A disease of unknown causation, called white pickle, is described supposedly for the first time. A very injurious stunting disease of celery is ascribed to a bacterium which plugs the vascular system. A somewhat similar disease of lettuce is named stunting disease of lettuce. *Sclerotinia libertiana* causes a disease of green-house lettuce and a trench rot of celery. Black rot of lettuce is supposedly associated with a *Rhizoctonia*. Chestnut bark disease has not been found in the State. Maple anthracnose and leaf scorch are contrasted. The *Phyllosticta* disease of horse chestnut has not proved to be serious. Certain heart rots, especially of maple, though doing serious damage, have largely escaped attention hitherto.

Investigation work [on the control of plant diseases and injurious insects in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 42 (1916), pp. 12-14).—It is stated that work during this year looking to the control of pear blight was successful, and that a bulletin is to be published on the practical control of that disease.

A somewhat extensive test was made on apples, plums, cherries, peaches and grapes of a dust mixture composed of 85 per cent very finely ground sulphur and 15 per cent lead arsenate powder, the latter being omitted when not required for insect control. The results have been previously noted (E. S. R., 37, p. 832). In case of apples treatment with calcium arsenate and soluble sulphur resulted in leaf fall and reduction of the size of the fruit.

Peach yellows and little peach have been shown to be spread by budding healthy stock with material from diseased trees. A considerable proportion of the pits from diseased trees (8 per cent) have grown, and none have as yet (after three years) developed the disease.

[Plant diseases in Ontario] (Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 42 (1916), pp. 15-18).—While certain fungus diseases were favored by the wet weather during the spring, some others which generally cause serious loss were unusually scarce, owing presumably to the dry weather of the summer months. The most injurious diseases of the year were peach leaf curl (*Eriococcus deformans*), apple scab (*Venturia pomi*), leaf spot or shot-hole fungus of cherry (*Cylindrosporium padi*), and raspberry cane blight (*Coniophthora fuckelii*). Winterkilling was also reported of raspberry and cherry, the latter having been almost completely defoliated by the shot-hole fungus during the previous summer.

Diseases thought to be new to Ontario are rust of cultivated snapdragons and a damping-off disease of young tomato plants, both of which are briefly discussed. The former is said to be due to *Puccinia antirrhini*, the latter to *Phytophthora infestans*.

The results of experimentation during four years indicate that late blight of celery may be prevented by spraying with 4:4:40 Bordeaux mixture when the plants are in the seed bed and at intervals of ten days or two weeks thereafter throughout the growing season. Lime-sulphur is not recommended for celery blight, but the results of one year's test with sulfocide indicate that this substance may prove to be a cheap substitute in this connection for Bordeaux mixture, which is now expensive on account of the high cost of copper sulphate.

Studies have been carried on in the life histories of the fungi causing leaf spot of currants and gooseberries. Overwintered currant leaves bearing *Septoria ribis* have always developed *Mycosphaerella grossularia*, the ascospores giving rise to a *Septoria* infecting *Ribes* spp. and presumably being *S. ribis*. Plants have also been infected directly with the ascospores. *R. aurea* is also infected with a species described as *S. aurea*, a perfect stage of which has been found and studied, and for this the name *M. aurea* has been proposed.

A report is made on investigations regarding the cause and control of a disease of winter tomatoes. This does not seem to be carried in the seed, and no organism has been isolated. Steaming the soil is not effective.

Only one white pine infected with blister rust was found.

[Plant diseases in Scotland, 1915], R. P. WRIGHT ET AL. (Rpt. Bd. Agr. Scot., 4 (1915), pp. LI, LII).—The total number of new cases of wart disease of potato reported during 1915 is given as 252. Experimentation has added to the list of known resistant varieties 2 early, 4 second early, and 12 late or main crop varieties. It is thought probable that the power of resistance to this disease may diminish from year to year. The formalin treatment for infected soil, as tested in a garden in which the disease had been present in severe form, proved entirely ineffective.

Inspection control measures regarding American gooseberry mildew having been neglected during the year 1914, the disease reappeared during 1915 in more virulent form and over greater area than formerly. It appears that where

both pruning and spraying or pruning alone had been carefully done the spread of the disease was effectively checked, but where spraying alone had been done, or where one of these treatments had been carelessly done the bushes were in most cases attacked more severely than usual. The disease was reported from new districts, being now present in nearly every county of Scotland.

Plant pathology (India), E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India*, 1915-16, pp. 103-113).—Ufra, due to *Tylenchus angustus*, the most important disease of rice at the present time, continues to extend itself, practically the whole of the districts of Noakhali, Tippera, and Dacca, and parts of Mymensingh and probably Sylhet being affected. The loss is very great, especially in some sections where the main crop is deep water paddy.

The parasite hibernates in the dried stubble, renewing its activity with the coming of the rains. It was found possible to carry the organism in an actively parasitic condition through its normal period of dormancy (December to April) by supplying constantly renewed young rice seedlings and keeping the air moist. This last is thought to be an indispensable condition, probably explaining the comparative immunity of the early crop and of the main crop in its earlier stages. The spring crop, which is, however, of minor importance, may not be liable to injury. The nematode does not appear to survive in the soil, as total destruction of all stubble is followed by a healthy crop. Extensive experimentation is in progress.

The work of the past two seasons has established the view that the parasitic species of *Orobancha* in Bihar are *O. indica* and *O. cernua*.

The work on the black thread disease of Hevea has been continued. This disease, which is active only during the monsoon rains, is not fatal but causes much damage by attacking the tapped area of the bark. The causal fungus, which is said to differ from *Phytophthora faberi*, attacks both bark and fruits at points of injury. The disease is favored by excessive humidity and shade. The fruits constitute the chief source of infection. *P. parasitica* found on *Uncaria racosa* has been studied and germination of the oospores has been accomplished, the resulting organism corresponding in essentials with *P. erythrospora* in Ireland.

The study of the opium poppy blight has led to the conclusion that while *Peronospora arborescens* is common and epidemic under favorable conditions, *Blasotonia* develops only under defective drainage conditions.

Colletotrichum nigrum causes a serious anthracnose of chilli peppers in several parts of India, the organism penetrating the pod and reaching the seed.

A plantain wilt prevalent at Pusa is said to be due to a *Fusarium* distinct from that causing the Panama disease. In severe cases the rot may reach the stem and kill the whole crown. Attack of the fruit stalk may lead to loss of the whole bunch. The fruit rot of plantain due to *Glæsporium musarum* is controlled by early spraying with Burgundy mixture and repeating this treatment every two weeks until the fruit is nearly ripe, when ammoniacal copper carbonate should be employed.

Polyporus shoreæ is the name given to what is considered a new fungus thought to cause a disease of sal trees and described on page 555.

The study of certain wilts of cotton, til, gram, chilli, and other crops has yielded no support to the view that such wilts are due to defective air supply for the roots or to other physical conditions in the soil, a *Fusarium* appearing to be the causal agent.

A brief account is given of the chief items of mycological work as carried out by other scientific departments (chiefly the provincial departments of agriculture), including the palm bud rot operations, a study of the black thread disease of Hevea, a disease of paddy (*Ephelia oryzae*), a root disease of coffee

(*Fomes australis*), chilli disease (*Vermicularia capsici*), a leaf disease of turmeric (*V. curcumæ*), koleroga and a leaf disease of coffee, brown blight (*Colletotrichum camelliae*) of tea, koleroga, (probably *Phytophthora areca*) of the areca palm, spike disease of the sandalwood tree, a *Fusarium* disease of the potato, mango mildew, a *Nectria* on fruit trees, smuts of jowar, grape mildew, loose smut of wheat, poppy blight (*Rhizoctonia* and *Peronospora*), and gray rim blight of tea.

Diseases and injuries to cultivated plants in the Dutch East Indies in 1916, C. J. J. VAN HALL (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 29 (1917), pp. 37*).—This is a general review, giving under the different economic plants condensed accounts of reports received from various centers on diseases observed, including injuries caused by some animal pests.

The rusts occurring on the genus *Fritillaria*, C. C. REES (*Amer. Jour. Bot.* 4 (1917), No. 6, pp. 368-373, figs. 3).—A key is given of *Uromyces aridiformis* *U. miurae*, *U. fritillariae*, and *U. holcayi* with descriptions of all but the last named.

Bacterial blight of barley, L. R. JONES, A. G. JOHNSON, and C. S. REED (*U. S. Dept. Agr., Jour. Agr. Research, 11 (1917), No. 12, pp. 625-644, pls. 4, figs. 2*).—In a contribution from the Wisconsin Experiment Station, a detailed account is given of a study of bacterial blight of barley, a preliminary note of which has been given (*E. S. R.*, 35, p. 845).

This disease, which is said to be widely spread and capable of producing serious loss, somewhat resembles other bacterial diseases of cereals and allied plants, but it is considered distinct from these, being caused by a hitherto undescribed organism. The disease is characterized by the appearance on the leaves of small, water-soaked areas which enlarge to yellowish or brownish, somewhat translucent blotches or irregular stripes. Similar lesions may appear later on the glumes, but the chief injury is to the foliage. While there is considerable difference in varietal susceptibility to this disease, all of the main groups of barley are more or less subject to its attack.

Culture and inoculation experiments have been made with the organism which have proved it to be the cause of the disease. A technical description is given of the organism, which has been named *Bacterium translucens* n. sp. The inoculation experiments have shown that the disease may be readily induced on barley by spraying with water suspensions of the organism, but negative results were obtained from inoculations on oats, rye, wheat, spelt, emmer, Einkorn, and timothy. The bacteria have been found capable of overwintering in infested leaves, but diseased kernels are considered the chief means of dissemination and source of spring infection.

No control measures have been worked out, but the authors consider avoidance of infected seed and seed disinfection as the most promising means of control.

Stinking smut and loose smut in wheat and barley (*Meded. Phytopath. Dienst Wageningen, No. 4 (1917), pp. 24, pls. 5*).—A brief account is given of the distribution, symptoms, progress, and effects of some grain smuts, including *Tilletia tritici*, *Ustilago tegeta hordei*, *U. tritici*, *U. nuda hordei*, *U. arenae*, and *Urocystis occulta*, with control measures in some detail, including costs of a treatment employed in a cooperative plan.

Stinking smut is best controlled by steeping the seed in a copper sulphate or formalin solution, loose smut by immersion of the seed grain for 10 minutes in water heated, in case of barley, to 51° C. (123.8° F.), of wheat to 53°, after which it should be spread to dry before sowing.

Potato and tomato diseases, N. J. GIDDINGS (*West Virginia Sta. Bul.* 165 (1917), pp. 24, figs. 21).—Descriptions are given of some of the most widely spread and destructive diseases of potatoes and tomatoes, with suggestions for their control.

For the prevention of these diseases, rotation of crops, selection of seed tubers and varieties, removal of diseased material, and thorough spraying with Bordeaux mixture are recommended.

In connection with the potato diseases, the author gives an account of an investigation to determine whether potato powdery scab was liable to become a serious menace in West Virginia. Badly diseased potatoes were planted in the field at the West Virginia Station, and at harvest time there was not the least sign of the disease on any of the tubers. This is believed to indicate that the climatic conditions are unfavorable to powdery scab.

A summary is given of spraying experiments for the prevention of potato diseases, from which it appears, as a result of six years' work, that plots sprayed with 5:5:50 Bordeaux mixture gave increased yields of from 11 to 53.5 percent. These experiments were conducted on a commercial scale and are believed to indicate the value of spraying even in seasons when neither early or late blight was prevalent. Tests of commercial lime sulphur, which is sometimes recommended as a potato spray, gave results indicating that this material should not be recommended for use on potatoes.

Our present knowledge of potato diseases: What they are and how to control them, H. A. EDSON (*Proc. Potato Assoc. Amer.*, 3 (1916), pp. 52-56).—The author gives a discussion of potato diseases, more particularly in the United States, including a leaf-bronzing trouble, now becoming prominent, which appears to be primarily of the malnutrition type, streak, mosaic, late blight (*Phytophthora infestans*), powdery scab, several diseases induced by *Fusarium* sp., blackleg, black scurf (*Rhizoctonia*), curly dwarf, and leaf roll.

It is thought that, aside from the specific measures mentioned in connection with these diseases, the most practical method for combating potato diseases is probably that of planting the best stock available in the best soil types, cultivating in the best manner, frequent roguing out of all undesirable plants, and careful selection of seed tubers.

Potato mildew or late blight, H. BOCHER (*Vie Agr. et Rurale*, 7 (1917), No. 11, pp. 369, 370).—This is a brief account of the manifestations, attacks, preventive effects, and control of *Phytophthora infestans* on potatoes.

The organism is said to require temperatures between 20 and 30° C. (68 and 86 F.) and to be controllable by means of two or three treatments of the potato plants with Bordeaux mixture, the first to be applied before the plants have bloomed, in May or June, the second, 20 days later. A third may profitably be given in August, if applied very promptly on recognition of its necessity. Seed treatments are also discussed, including the use of copper sulphate and that of sulphuric acid. Some resistant varieties are named.

The so-called Lahaina disease and other diseases of sugar cane, H. P. ALEX (*Proc. Hawaii. Sugar Planters' Assoc.*, 36 (1916), pp. 18-20).—It is stated that soil studies by Burgess continue to point to a correlation between the occurrence of black alkali and the failure of the cane variety known as Lahaina, which, though vigorous, gives way under various unfavorable environments. Tests following out this theory by treating the soil with gypsum or with green manure have not proved conclusive.

Infectious top rot is reported by Lyon to have appeared on Oahu and Maui during the year, though apparently confined to Kauai for the previous eight years. This disease, which is considered dangerous, was arrested by cutting and burning the affected canes.

A new and peculiar leaf spot was noted on a cane variety brought from Kauai, but the trouble rapidly disappeared.

A peculiar disease noted in Hawaii and characterized by early yellowing and death of the leaves is ascribed to a fungus attacking the leaf bases.

[The Lahaina disease of sugar cane], G. F. RENTON (*Proc. Hawaii Sugar Planters' Assoc.*, 36 (1916), pp. 57-61).—The Lahaina trouble is said to have caused grave concern to many growers of sugar cane. The trouble is ascribed to various causes, such as top rot, stellar crystals at the roots, sending excess of sodium bicarbonate due to poor drainage, or some combination of these causes.

On one plantation ammonium sulphate has been applied continuously from 1909 to 1917, except when an equal portion of sodium nitrate was added in 1911, resulting in a more or less regular diminution of the trouble. It is considered probable that conditions favorable to the growth of the Lahaina variety can be gradually brought about by using less sodium nitrate and more sulphates, including gypsum, and by conserving the trash, all of which measures oppose alkalinity. Breeding experiments are also recommended.

Diseases and pests of sugar cane in the Philippines, E. B. COPELAND (*Philippine Agr. and Forester*, 5 (1916), No. 10, pp. 343-346).—A condensed account of animals and fungi locally injurious to sugar cane includes, as known representatives of the latter class, *Puccinia kuehnii* (leaf rust), *Ustilago sacchari* (smut), *Bakerophoma sacchari* (leaf spot), *Cercospora* spp. (leaf spots), *Phyllosticta sacchari*, *Meliola arundinis*, *Apiospora cantospora*, *Coniosporium extremum*, and *C. vinosum* (on dead leaves), *Melanconium sacchari* (rind disease), and *Dactyophora phalloidea*, and a *Marasmius* attacking the roots. A broom rape *Argemone indica*, is a root parasite on cane and other grasses.

It is supposed that most of the recognized cane pests and diseases are present at this time in the Philippines, owing to the antiquity of sugar culture and the presence of wild sugar cane in the islands.

Orchard diseases, J. F. ADAMS (*Proc. State Hort. Assoc. Penn.*, 58 (1916), pp. 69-77, pls. 5).—This discussion emphasized a few of the more important diseases of apple and peach, more particularly scab (*Venturia pomi*), which is designated as the most serious of the orchard diseases, apple fruit spot or Baldwin spot (*Phoma pomi*), blotch (*Phyllosticta solitaria*), sooty blotch and fly speck (*Leptothyrium pomi*), with a schedule for the spraying of apples, peach scab (*Cladosporium carpophilum*), brown rot (*Sclerotinia cinerea*), and peach-leaf curl (*Eroasca deformans*), with a schedule for spraying peaches.

Apple scab and methods of its control, A. J. GUNDERSON (*Trans. Ill. Hort. Soc.*, n. ser., 50 (1916), pp. 357-364).—Apple scab is thought to have caused more damage to apple orchards in northern Illinois during the past two years than any other factor, and it is thought that western New York and Michigan suffered even greater losses.

In addition to reducing the quality of the fruit, this disease increases premature dropping to a considerable extent and lowers the keeping qualities of the apple by furnishing conditions for the entrance of such organisms as those of pink rot, brown ripe rot, and black rot. Severe infection of the foliage also devitalizes the tree to a considerable extent, affecting future crops.

The occurrence of the organism on twigs is rare or unknown in Illinois. The disease is described as to the development and life history of the causal organism.

Bordeaux mixture and lime-sulphur were found to be of about equal value as regards the control of apple scab, but the former may russet the fruit and injure

the foliage, while the latter may burn the fruit if applied freely in very hot weather after July 1, though it favors high coloration and finish and vigorous foliation. Lead arsenate is said to increase the fungicidal effectiveness of lime-sulphur. Four applications are ordinarily required for primary apple-scab infection, or more in a wet season, such as that of 1915. Late fall or early spring plowing is recommended to reduce the infection.

Spraying experiments in 1916 for the control of apple blotch. A. J. GUNNISON (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 248-251*).—Reviewing previous work and conclusions by several investigators, the author notes briefly the results of tests made at Flora, Clay County, Ill., in 1916 against apple blotch on 16-year-old Ben Davis trees, employing different fungicides.

Bordeaux mixture (3:4:50) proved superior to lime-sulphur (2½ gal. to 100 gal. water) as regards protection, though it showed some russetting of the fruit. Both these sprays are regarded as valuable for protection if used three, five, and seven weeks after the fall of the blooms. It is not advisable to alter these sprays.

Points which were emphasized in the course of these observations were that unpruned trees or trees with dense tops do not permit thorough spraying, that low pressures are absolutely inadequate as regards apple blotch control, that every part of the tree must be reached and covered, and that applications must be made at the proper times in order to be successful.

Results of spraying experiments at the Neoga Station, Cumberland County, 1916. W. S. BROCK (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 252-259*).—The spraying at Neoga, Ill., during 1916 is said to have demonstrated that a dust mixture should contain only active ingredients, of which from 80 to 90 per cent may be fungicidal, the rest insecticidal. Even distribution of dust sprays requires exceeding fineness of materials, so that the dust will remain suspended in the air as long as possible, enveloping the tree in a dense cloud.

Liquid sprays are deemed superior to dust sprays as at present applied, though the latter have some advantages in favored localities, their place being rather that of a supplemental application or a means of reaching the trees in cases where breakdowns or failure of water supply make liquid sprays unavailable. It may develop later from work to be done that certain applications, such as the follow-up spray or that applied 10 days after blooming, should employ the dust mixture.

Figures are given on costs and on the relative effectiveness of sprays on insects, scab, blotch, and sooty blotch. It is concluded that liquid sprays are more efficient, they can be applied during high or shifting winds, they cost less, and they can be used as dormant sprays; while dust sprays can be applied more quickly and require fewer men and teams.

One season's experience with the dust spray. W. S. PERRINE (*Trans. Ill. Hort. Soc., n. ser., 50 (1916), pp. 470-472*).—It was found that a great saving in equipment and time could be effected by substituting the dust for the liquid form of spray. Almost perfect results were obtained with early apples, but conditions and results were less favorable in case of late apples. A combination of liquid and dust gave very excellent results. Peaches on which dust alone was used also showed decided benefit from the treatment.

A bacterial disease of the Wragg cherry. W. G. SACKETT (*Jour. Bact., 2 (1917), No. 1, pp. 79, 80*).—A disease observed by the author first in the summer of 1915 and kept under observation for further reports causes spots or streaks on cherries (which appear to start only before ripening), also on the stems (the cherries sometimes dropping prematurely), leaves (causing a shot-hole appearance), and young twigs (causing watery, elliptical, olive-brown dis-

colorations surrounding the lenticels, which elongate with age and become somewhat sunken and darker in color). The disease appears almost identical with the bacterial disease of peach and plum ascribed to *Pseudomonas* (*Bacterium*) *pruni* but not known to have been found previously on the cherry, of which only the Wragg variety appears to be affected.

Spraying experiments with self-boiled lime-sulphur reduced the fruit injury from 41.4 to 10.2 per cent.

Abnormal blossoms on black currant, R. G. HATTON and J. AMOS (*Gard. Chron.*, 3. ser., 61 (1917), No. 1584, p. 180, figs. 3).—Black currant bushes at the Wye Station under observation for two seasons have shown, in a bush that was conspicuously nettle headed, a further abnormality in which the fruiting spurs of the abnormal inflorescence consisted of one or more single blossoms, each on a short pedicel, together with several racemes, the abnormal condition of the blossoms differing in the two instances as described. Both types of abnormal blossom appeared on each spur and were fairly frequent over the whole bush, which showed no normal flowers and set no fruit. The observations are to be continued.

A new disease of grapevines, Acarinosis in Navarra, A. AZANZA (*Prog. Agr. y Pecuário*, 23 (1917), Nos. 999, pp. 64, 65; 1001, pp. 89-91; 1007, pp. 156, 160; 1012, pp. 221-223; 1014, pp. 245-247).—This is a discussion of the abnormality of grapevine said to be known universally in France as court noué, of the work and the views of various investigators thereon, of the damage suffered in connection with this condition of grapevines, of more or less similar conditions as variously reported, of somewhat inconclusive experimentation testing for transmissibility of this condition, of the organisms found in connection therewith, of the probability of a connection between court noué and the occurrence of acarids on the vines, of the conditions apparently related to the occurrence of the trouble (weather, soils, and age of the vines), and of remedial measures.

Prevention of mildew outbreak, J. CASCÓN (*Prog. Agr. y Pecuário*, 23 (1917), No. 999, pp. 70, 71).—This is a discussion of the preparation and use of the deaux mixture or of copper acetate for grape downy mildew. The period between the swelling of the buds and the opening of the blooms is considered a time of great danger to the plant on account of the rapid growth and exposure of susceptible surfaces to the infection.

Control measures against grape downy mildew, V. C. MANSO DE ZÓÑIGA (*Prog. Agr. y Pecuário*, 23 (1917), No. 1009, pp. 182-184).—This contains reference to results of work in 1915 as bearing upon the problems of the current year, and more particularly as showing the efficacy of copper sprays, when properly made and used, against grape downy mildew.

Copper sulphate and copper sprays, V. C. MANSO DE ZÓÑIGA (*Prog. Agr. y Pecuário*, 23 (1917), No. 1007, p. 163).—As the result of tests at the Haro station, it has been found possible to reduce the copper sulphate in the sprays employed against grape downy mildew to 0.5 per cent by employing casein. The reduction of the copper content to 0.25 per cent has not proved successful.

Treatment of grape downy mildew and Oidium, V. C. MANSO DE ZÓÑIGA (*Estac. Enol. Haro Mem.*, 1916, pp. 40-47).—As the result of tests with fungicides for use against grape Oidium and downy mildew, it is stated that Bordeaux mixture with casein proved to be as effective at 1 per cent strength as without casein at 2 per cent. A preparation of very high basicity produced serious injury in all tests.

A bacterial spot of citrus, ETHEL M. DODGE (*Ann. Appl. Biol.*, 3 (1917), No. 2-3, pp. 53-81, pls. 11).—An account is given of a citrus disease in the western part of the Cape of Good Hope. The primarily causal organism is described as a new species (*Bacillus citrimaculans*). It is symptomatically characterized

dark sunken spots on the fruit and shoot. The infection gives entrance to fungi which destroy the fruit.

A bacterial spot of citrus fruits, ETHEL M. DOIDGE (*Agr. Jour. So. Africa*, 1915, No. 11, pp. 180-182, pls. 2).—This is a condensed account of the disease noted above.

Bud rot of the coconut palm, C. H. KNOWLES (*Dept. Agr. Fiji Pamphlet 20* 1916, pp. 2).—A brief general account of coconut bud rot in other places is followed by a sketch of conditions noted in Fiji, with suggestions regarding points to be observed in suspected cases.

Investigation of diseases of the rose (*Gard. Chron. Amer.*, 21 (1917), No. 6, p. 240).—Investigations carried on since August 1, 1916, in northeastern United States are said to show that the more important rose diseases prevalent, in that order, are black spot, mildew, crown gall, stem canker, *Phyllosticta* leaf spot, rust, bud rot, and miscellaneous leaf spots. Fungi and bacteria causing other diseases are being studied.

A disease which appears to be new and important is briefly described under the name crown canker. Specimens have been sent in from many States extending as far west as Missouri. It was first observed by the author in September, 1916, but has possibly been present for four or five years. All rose varieties appear to be susceptible. The attack occurs just beneath the leaf surface, advancing slowly, but killing the plant eventually after a decline in the number and quality of the flowers. Control experiments are now under way. The fungus is thought to live in the soil and to necessitate soil sterilization when the organism has once gained a foothold.

Montana forest tree fungi.—I. Polyporaceæ, J. R. WEIR (*Mycologia*, 9 (1917), No. 3, pp. 129-137, pl. 1).—The present list, confined to the Polyporaceæ, is the first part of a classified record intended to include the names of all forest tree fungi of importance to be found in Montana.

Observations on forest tree rusts, J. R. WEIR and E. E. HUBERT (*Amer. Jour. Bot.*, 4 (1917), No. 6, pp. 327-335, figs. 2).—It is suggested, in view of comparisons made (pending a study of cultures which is considered necessary for final determination), that *Uredinopsis copelandi* be considered as identical with *U. pteridis*, a technical description of the æcial stage of which is given.

Data briefly noted indicate the presence of a biological species of *Pucciniastrum pustulatum* occurring on *Epilobium adenocaulon* and overwintering by means of mycelium and uredinia upon the rosettes which live until spring.

Studies carried out on *Colcoasporium solidaginis* occurring on Aster and Solidago are said to confirm the conclusions of Mains (*E. S. R.*, 36, p. 647) regarding the wintering habit of this fungus.

A practical method of preventing the damping-off of coniferous seedlings, C. A. STOTT (*Jour. Forestry*, 15 (1917), No. 2, pp. 192-196, pls. 2).—A method said to be practical and highly satisfactory is described of sterilizing forest nursery seed beds with steam delivered at 120 to 160 lbs. pressure for from 35 to 60 minutes under inverted pans previously weighted down. This plan has passed the test of use for two seasons very favorable to the fungus, causing the damping-off of coniferous seedlings, except in the case of the Engelmann spruce. The unsterilized beds of all species showed almost a total loss. Germination in the sterilized beds occurred from two to four days earlier and was more nearly complete, giving a considerable saving in the cost of seeds. This method also destroys all weed seeds, thus eliminating the cost of weeding and counterbalancing thereby the entire expense of sterilizing the beds. The seedlings in the sterilized beds made a much more vigorous growth, attaining

before the close of the growing season from two to four times the size of those on the untreated beds.

How to preserve the oaks, L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]* 24 (1917), No. 25, pp. 957-959).—The injury done to oaks by mildew since 1904 is attributed largely to the defective methods of lopping in vogue, the resulting changes in the form of the tree and the disturbance of equilibrium between the fundamental processes culminating in a greater degree of susceptibility.

Hevea canker, III, A. A. L. RUTGERS (*Dept. Landb., Nijf en Handel [Ind. East Indies], Meded. Lab. Plantenziekten*, No. 28 (1917), pp. 49, pls. 12, figs. 2).—Reporting further (E. S. R., 37, p. 453) on Hevea canker, the author states that the stripe canker, which shows a decay of the renewing bark and appears only during the very wet weather of the rainy season, may be induced artificially by applying conidia suspended in water to the wounds made by tapping. The black lines enlarge and may so fuse as to cover the whole surface of the renewing bark. Transition stages between stripe canker and ordinary canker may be found. The disease may spread with exceptional rapidity where tapping is kept up or where water is used on the tapping cuts. Carbolineum formerly used as an antiseptic at 50 per cent concentration, is now used at 2 per cent, and it is thought that this may be safely reduced perhaps to 5 per cent.

Both forms of canker are due to *Phytophthora faberi*. Canker patches of the ordinary sort are produced by inserting mycelium into an incision in the bark. Bur formation of a certain sort described is regarded as a symptom of canker. Under favorable circumstances the trees recover from light attacks provided tapping is stopped.

The *Phytophthora* forms from Hevea, cacao, and nutmeg are said to belong to the same species. The strain from cacao is more virulent for that host and for Hevea, and the nutmeg strain for its own host. Comparisons of pure cultures are said to show that morphologically the four forms *P. faberi*, *P. nestorianæ*, *P. colocastæ*, and *P. jatrophae* are distinct species, the last named being of the type of *P. infestans*, and *P. fagi* and *P. cactorum* being quite different from the others.

Preventive measures considered as most important for canker include thinning, drainage, and removal of intercrops, pruning having been abandoned. Direct measures include cutting out the red patches of canker and the application of carbolineum to the stripe cankers. The disease should be detected early and tapping stopped.

It is thought from very recent experiments that stripe canker can be prevented entirely. *P. faberi* can attack unwounded fruit, causing a rot which may spread very rapidly. *Drosophila* appears to be an active agency in spreading the disease. The burs found on Hevea trunks may be the result of leaf scars, pricking, or canker. Of the last named there are two forms, one deep-seated, the other due to secondary wood formation in the cortex and curable by stopping the tapping and treating the cankers.

Abnormal leaf fall of Hevea rubber, W. McRAE (*Planters' Chron.* 11 (1916), No. 37, pp. 459-465).—This is a report of a lecture before the United Planters' Association of South India in which the speaker discussed some preliminary studies of a disease which is now attributed to a *Phytophthora* hitherto but little known on rubber plantations, having been first mistaken for *P. faberi*. The effects of the disease on the different parts of the plant are described. It was first definitely noted as a fruit rot, but is now also characterized by an abnormal shedding of leaves from June to August.

Polyporus shoreae (Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 3 (1916), p. 12).—A fungus suspected to cause a serious disease of sal (*Shorea robusta*) described under the name of *P. shoreae*. The effect on the wood is said to be similar to that produced by *Trametes pini*, but more marked.

The black zones formed by wood-destroying fungi, A. S. RHOADS (*Syracuse Univ. [Publ.]*, 17 (1917), No. 28, pp. 61, figs. 7).—This is the beginning of an attempt to throw some light on the nature and significance of the black lines or zones of decay which accompany several fungi in many kinds of wood. These are said to indicate the first stage of decomposition in dicotyledonous woods, but may also be found in wounds in such trees while living or when but recently fallen, even before the presence of fungi can be demonstrated, being in this case due solely to oxidation of the woody substance. These decomposition products are said to arise only after the death of the cells through the oxidation of their contents and certain constituents of the cell walls, this formation occurring most notably in the parenchyma cells, which are infiltrated, causing the appearance of blackish zones of varying thickness. Wood thus infiltrated is to be considered as pathological heartwood. The blackish zones move forward with the advance of decay and disappear with its completion in a given region. In coniferous woods the formation of these decoloring decomposition products is relatively insignificant. Three factors said to be necessary are the presence of dead cells, an optimum supply of moisture, and sufficient oxygen to supply demands of the oxidation process.

The partially decomposed material of woody plants forms a particularly large and indefinite group of substances containing the nonvolatile products of the action of fungi, enzymes, and oxygen, all of which are exceptionally resistant to chemical reagents.

It is possible to prepare, by oxidizing fresh sapwood, a product resembling that resulting from decomposition in various woods, either in wounded areas of living trees, in dead wood, or as the result of the activity of wood-destroying fungi. Decomposition products resembling the so-called wound gum are caused by oxidation or else by wood-destroying fungi which hasten the decomposition and hence the oxidation.

Damage by spurs, J. L. RICHARDS (*Mass. Forestry Assoc. Bul.*, 117 (1915), p. 26-27, pls. 3).—An account of the admission of destructive nematodes and fungi, including chestnut blight, by way of the wounds made by climbing irons, which leads to the conclusion that spurs should not be used on valuable trees.

Tests with chemicals on control of nematodes, T. A. C. SCHOEVEERS (*Meded. Rijk Hogere Land, Tuin en Boschbouwsch. [Wageningen]*, 12 (1917), No. 1, p. 46-48).—The author reports some preliminary tests with several chemicals in attempting to control *Heterodera radiculicola* in roots of tomato plants. He states that lime mixed with ammonium sulphate gave the best results, but that these were almost equaled by those from naphthalin and those from formalin. The compounds tested seemed rather to favor the development of the nematodes.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The vertebrate zoologist and national efficiency, W. P. TAYLOR (*Science*, n. s. 46 (1917), No. 1180, pp. 123-127).

Conservation of game in the National Forests and National Parks, E. W. NELSON (*Amer. Forestry*, 23 (1917), No. 279, pp. 139-145, figs. 10).

What Big Lake [Reservation] means as a game refuge, G. W. FIELD (*Wild Life*, 1 (1917), No. 1, pp. 5, 15, fig. 1).

Rio Grande bird reservation, New Mexico, G. WILLETT (*Reclam. Rec. [U. S.]*, 1 (1917), No. 4, pp. 190, 191, fig. 1).

A visit to the heronry at Walker Lake.—Even the egret, once on the verge of extinction, is coming back on this fine sanctuary, R. A. HOLLAS (*Wild Life*, 1 (1917), No. 2, p. 9).

Lost and disappearing wild birds of Missouri, W. L. MCATEE (*Wild Life*, 1 (1917), No. 2, pp. 7, 16).

The birds of the Anamba Islands, H. C. OBERHOLSER (*U. S. Nat. Mus. Bul.* 98 (1917), pp. 75, pls. 2).

Birds collected by Dr. W. L. Abbott on various islands in the Java Sea, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 54 (1917), pp. 177-200).

The status of *Aphelocoma cyanotis* and its allies, H. C. OBERHOLSER (*Condor*, 19 (1917), No. 3, pp. 94, 95).

Notes on the fringilline genus *Passerherbulus* and its nearest allies, H. C. OBERHOLSER (*Ohio Jour. Sci.*, 17 (1917), No. 8, pp. 332-336).

A review of the subspecies of the leach petrel, *Oceanodroma leucorhoa*, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 54 (1917), pp. 165-172).

The relationships of the fossil bird *Palaeochenoides miocenus*, A. WYMORE (*Jour. Geol.*, 25 (1917), No. 6, pp. 555-557, fig. 1).

How to attract birds in the East Central States, W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul.* 312 (1918), pp. 14, figs. 11).—This, the fourth of a series of bulletins describing the best methods of attracting birds in various parts of the United States (*E. S. R.*, 38, p. 53), covers the territory west of Pennsylvania, north of Tennessee, and east of the one-hundredth meridian.

The agricultural value of bird life in Louisiana, H. H. KOPMAN (*Mod. Farming*, 47 (1917), No. 12, pp. 3, 4).—This account includes a brief report of several bird counts made on farm land in Louisiana during the breeding season of 1915.

On the life history of a soil ameba, C. W. WILSON (*Univ. Cal. Publ. Zool.*, 16 (1916), No. 16, pp. 241-292, pls. 6).—A detailed report of studies of the life history of *Nargleria gruberi*, pure mixed cultures of which were maintained under laboratory conditions for a period of two years. In these cultures encystment and excystment, enflagellation and exflagellation, and exogenous and endogenous budding were observed and are described. A bibliography of 45 titles is included.

Ninth annual report of the State entomologist of Indiana, F. N. WALLACE (*Ann. Rpt. State Ent. Ind.*, 9 (1915-16), pp. 230, figs. 132).—This report includes papers on Some Injurious Insect Pests of the Year (pp. 23-47) which incorporates a paper by M. E. Kinsey on the Onion Thrips; Some Common Diseases of Vegetables (pp. 77-90) and Directions for Sterilizing Soil in Plant Beds and Greenhouses (pp. 91-96), by J. B. Demaree; Report of the State Inspector of Apiaries (pp. 98-104); and Some of the Important Insect Pests of Indiana, by R. E. Snodgrass (pp. 105-225).

Report of the entomologist for 1916, H. A. SURFACE (*Penn. Dept. Agr. Bul.* 290 (1917), pp. 65-70).—This is the usual annual report (*E. S. R.*, 37, p. 430).

Report of the Dominion entomologist for the year ended March 31, 1916, C. G. HEWITT (*Canada Dept. Agr., Rpt. Dominion Ent.*, 1916, pp. 73, pls. 4).—This reports on the work of the year under the headings of the administration of the Destructive Insect and Pest Act; introduction of parasites and predatory enemies of the brown-tail and gipsy moths; insects affecting cereal and other field crops, garden, and greenhouse; and insects affecting forest and shade trees. Summary reports of the work carried out at the field laboratories follow.

[Insects of economic importance in Cuba] (*Sec. Agr. Cuba, Com. Saad. Veg.*, *Bul.* 1 (1917) [*English Ed.*], pp. 36-43, 52-66, 67-77, pls. 22).—The injury caused to sugar cane by *Pseudococcus sacchari* (pp. 36-38) and by the cercopid

Monophora bicincta (pp. 38-43), particularly to parana grass (*Panicum nudum*) in Camaguey, is reported upon. A list is given of the insects and diseases of economic importance in Cuba arranged according to their host plants (pp. 52-66), and an account of the occurrence of the spiny citrus white fly (*Alcurocanthus scopolumi*) in Cuba, including a list of host plants (pp. 67-71), references to which have been previously noted (E. S. R., 38, p. 462; 38, p. 158).

[Entomological investigations] (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com., 1917, pp. 6-11*).—This is a summary of the entomological work at the Hawaiian Sugar Planters' Station. Particular attention was given to work with the natural enemies of the Anomala beetle.

[Hawaiian insects] (*Proc. Hawaii. Ent. Soc., 3 (1916), No. 4, pp. 270-272, 274, 276-280, 287, 288, 292-294, 296-368, figs. 61*).—The papers here presented include the following: Notes on Two Species of Hawaiian Diptera (*Brachydesatera argentata* and [*Homalomyia*] *Fannia pusia*) (pp. 270-272), *Clerada spicicornis* Sucking Blood (p. 274), and Webbing Clothes Moth (*Tineola bisellatella*) Predacious (p. 274), by J. F. Illingworth; Notes on a Peregrine Bethyld (*Epyris extraneus* n. sp.) (pp. 276-279) and Notes on *Dictyophorodelphax mirabilis* (pp. 279, 280), by J. Bridwell; Notes on the Life History of *Attagenus pictus*, by J. F. Illingworth, an account of which has been previously noted (E. S. R., 37, p. 567) (pp. 287, 288); Description of a New Species of Spalangia, *S. philippinensis*, a parasite of the horn fly (*Lyperosia irritans*) introduced from the Philippines in 1914, by D. T. Fullaway (pp. 292-294); Exhibition of "Types" of Some Recent Hawaiian Lepidoptera [41 species], by O. H. Swezey (pp. 296, 297); New Hawaiian Delphacidae, including descriptions of 1 genus and 15 species and subspecies new to science (pp. 298-311) and Homopterous Notes, including descriptions of 26 new species (pp. 311-338), by F. Muir; Reference Tables of the Hawaiian Delphacids and of Their Food Plants, by W. M. Giffard (pp. 339-348); and Economic Aspects of our Predacious Ant (*Pheidole megacephala*), by J. F. Illingworth (pp. 349-368).

Annual report for 1916 of the zoologist, C. WARBURTON (*Jour. Roy. Agr. Soc. England, 77 (1916), pp. 222-234, figs. 4*).—This consists in large part of a report upon the occurrence of some of the more important insects.

British insects and how to know them, H. BASTIN (*London: Methuen & Co., Ltd., (1917), pp. 129, pls. 12; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 7, p. 227*).—This is a small text-book comprising a popular introduction to the study of British insects.

Insect and arachnid pests of 1916, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5, ser., 29 (1917), pp. 116-152, figs. 25*).—This reports observations of the occurrence, etc., of the more important insect and arachnid pests of the year (E. S. R., 36, p. 252).

Imported insect pests, C. VROOMAN (*Country Gent., 82 (1917), No. 43, pp. 12, 13, figs. 8*).

Grass and clover insects, C. R. CROSBY and M. D. LEONARD (*N. Y. State Col. Agr., Cornell Ext. Bul., 20 (1917), pp. 20, figs. 18*).—A popular account of the more important grass and clover insects.

Chortophila cilicrura and *Thereva* sp., pests of rye in Silesia, Germany, OBERSTEIN (*Ztschr., Pflanzenkrankh., 26 (1916), No. 5, pp. 277-280; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 10, pp. 1558, 1559*).—In Silesia during the period 1914-15 it was observed that over a vast area the leaves of rye were completely devoured by *C. cilicrura*. Corn was attacked, but not to the same extent as rye, and lupines that followed rye were also attacked. Another pest, an undetermined species of the dipterous genus *Thereva*, is also mentioned as attacking rye.

[Potato and alfalfa insects], E. ESCOMEL (*Bol. Min. Fomento [Peru]*, No. 4 (1917), pp. 41-51).—The potato aphid (*Macrosiphum solanifolii*), a small coleopterous (*Omiscus murarios*), and a lepidopteran are reported as injuring the potato, and the red spider (*Tetranychus telarius*) as injuring alfalfa.

Insects affecting vegetables, C. J. S. BETHUNE (*Ontario Dept. Agr. Bul.* 25 (1917), pp. 32, figs. 44).—A popular summary of information.

The rôle of insects as carriers of fire blight, H. A. GOSSARD (*Rpt. Proc. Mont. State Hort. Soc.*, 19 (1916), pp. 84-90).—Substantially noted from another source (*E. S. R.*, 35, p. 662).

Insects affecting coffee in Porto Rico, R. H. VAN ZWALUWENBURG (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 513-517).—A brief report of observations of the insect pests of coffee in Porto Rico, in which the coffee leaf miner (*Leucoptera coffeella*), the coffee leaf weevil (*Lachnopus* sp.), and the coffee shade bug (*Myrmelachista ambigua*) are given particular attention.

A summary of our knowledge of insect vectors, M. E. MACGREGOR (*Jour. Trop. Med. and Hyg. [London]*, 20 (1917), No. 18, pp. 205-209).—This is a summary of our knowledge of the more important insect-borne diseases and their vectors, much of the data being presented in tabular form.

On the selection and breeding of desirable strains of beneficial insects, C. W. MALLY (*So. African Jour. Sci.*, 13 (1916), No. 5, pp. 191-195).—The author here discusses the possibility of developing desirable strains of beneficial insects, particularly as relates to the lady beetle.

Crop pest controls, J. G. SANDERS (*Penn. Dept. Agr., Bur. Econ. Zool.*, 1917, n. ser., Circa. 3, pp. 15; 4, pp. 9).—These circulars consist of brief summaries of information on insect pests and control measures.

When does the cost of spraying truck crops become prohibitive? V. I. SAFERQ (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 521-523).—The author suggests the following rule:

"The cost of spraying truck crops for pests that threaten to destroy all or a large part of the crop does not become prohibitive until the immediate application in view, together with such following farm operations as can be definitely foreseen, have a total cost in excess of the reasonable expectation of gross returns from the crop in question."

A device for sowing grasshopper poison, T. H. PARKS (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 524, 525, pl. 1).—The author describes and illustrates a seeder for applying poison bran mash over large areas, improvised during a grasshopper campaign in western Kansas. It consists of a canvas bag which is strapped over the shoulder of the operator and fitted with a feeding device consisting of a canvas sleeve and swinging tube made of tin or galvanized iron.

A suggestion for the destruction of cockroaches, C. W. HOWARD (*Jour. Econ. Ent.*, 10 (1917), No. 6, p. 561).—The author's experiments show that exposures to temperatures of from 122 to 140° F. for 20 minutes; 24° for 3 hours; 18° for 20 minutes; 10° for 5 minutes; and 0° for from 5 to 10 minutes will destroy 100 per cent of the croton-bugs (*Blatella germanica*).

Experiments on the physiology of digestion in Blattidae, E. W. SANFORD (*Proc. Soc. Expt. Biol. and Med.*, 13 (1916), No. 8, p. 193).—The author's investigations, which confirm the earlier work of Petrunkevitch (*E. S. R.*, 11, p. 767), show that fat is split to soluble products and absorbed in large amount in the crop of the cockroach.

Sex determination in Anthothrips verbasci, A. F. SHULL (*Genetica*, 2 (1917), No. 5, pp. 480-488).—A report of work with the mullen thrips carried on in continuation of that previously noted (*E. S. R.*, 36, p. 252). It is shown that virgin females produce only male progeny.

Key to the species of *Leptoglossus* occurring north of Mexico, E. H. GIBSON (*Psyche*, 24 (1917), No. 3, pp. 69-73).

On the possibility of the transmission of plague by bedbugs, J. W. CORNWALL and T. KESAVA MENON (*Indian Jour. Med. Research*, 5 (1917), No. 1, pp. 137-159).—The authors find that bedbugs fed on a case of septicemic plague are a potential source of danger.

Meals which contain bacteria are frequently fatal to bugs. On occasion bugs may survive an infection with *Bacillus pestis* for 38 days, and the bacillus may be recovered from their stomachs by culture at the end of that time. Bugs can not regurgitate their stomach contents in the act of feeding. If, therefore, bugs transmit plague by biting, they must do so by washing out with the saliva bacilli which have been stranded in their sucking tubes. Bacilli are not likely to remain in the sucking tube for long after an infected feed. It can not yet be stated for certain whether bugs can or can not transmit plague by biting. The likelihood of the transmission of human plague by bugs feeding under natural conditions is small.

The hop redbug (*Paracalocoris hawleyi*), I. M. HAWLEY (*Jour. Econ. Ent.*, 1917, No. 6, pp. 545-552, pl. 1, figs. 8).—Each year since 1913 this pest has increased in numbers and caused more and more injury in hopyards about Waterville, N. Y., especially in the vicinity of Sangertfield, by perforating the leaves and stunting and deforming the stems. The initial injury is made evident by many light spots in the still unfolded leaves.

An account of its life history is accompanied by technical descriptions of its several stages, including five nymphal instars. The overwintering eggs are found on hop poles from the middle of August until September and hatch the following year from June 1 until nearly the first of July. The nymphal period lasts about 30 days, the adults beginning to appear about the first of July.

Several predators are mentioned as natural enemies, including *Apeteticus californicus*, *Reduvius subcoleopratus*, and *Trombidium* sp. Blackleaf 40, at the rate of 1 pint to 100 gal. of water with 6 lbs. of soap, applied on July 17, apparently killed at once. In order to be successful the spraying should be done about the third week in June before the vines have produced large arms.

A contribution to the knowledge of the biology of *Tingis pyri*, D. DURANTE (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 11 (1917), pp. 282-290; also in *Rev. Appl. Ent.*, Ser. A, 5 (1917), No. 8, p. 342).—A report of observations of this pest made during the spring of 1914 on apple trees on which an outbreak had occurred the previous summer.

The apple and pear are the cultivated plants in Italy usually attacked, although a case was observed where an infestation of a plum tree took place from nearby apple trees. The following sprays were found to give satisfactory control: (1) Petroleum 1 lb., soft soap 1 lb., and water 10 gal., or (2) soap 2 lbs. and water 10 gal., and (3) soft soap 1 lb., carbolic tobacco extract 1 lb., and water 10 gal.

A few notes chiefly on the names of nearctic *Tingidæ*, W. L. MCATEE (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 4, pp. 78, 79).

Key to the nearctic species of *Leptotypha* and *Leptostyla*, W. L. MCATEE (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 3, pp. 55-64).

Amphiscepa bivittata in its relation to cranberry, H. B. SCAMMELL (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 552-556, pl. 1).—This is a report of observations of the biology of the fulgorid *A. bivittata*, made during the course of cranberry insect investigations in New Jersey and on which but little has been previously reported. The author suggests that, since this insect is commonly associated with the cranberry and attacks the woody stems and not the foliage of

the plant, it be called the cranberry vinehopper in preference to the "broad-winged leaf-hopper" by which it has been known.

Though the pest is said to be essentially one of secondary importance, being found only on vines in an unthrifty or dying condition, due to injury by other insects or drought, it has been taken in every cranberry section of the State. The author has reared the nymphs from egg punctures made in the wood of the swamp blueberry (*Vaccinium corymbosum*) as well as from cranberry. One generation a year is produced, hibernation taking place in the egg stage on winter flooded bogs or those not flooded at any time.

Effective remedy consists of the removal of the major insect pests and the general improvement of conditions of vine growth by better cultural methods such as pruning, sanding, and the application of fertilizers. Reflowing the bog about August 1 for a period of 24 hours, at which time the nymphs will have hatched and no eggs have been laid by the new adult, is suggested. A light wind will blow the bugs to one shore, where they may be killed by the use of a kerosene-burning spray torch.

The family Isometopidæ as represented in North America, E. H. GIBSON (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 4, pp. 73-77).—Three species are described as new and the genus *Lidopus* erected.

A key to the species of Dictyophara, E. H. GIBSON (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 3, pp. 69-71).

The pear woolly aphid, W. M. DAVIDSON (*Mo. Bul. Com. Hort. Cal.*, 6 (1917), No. 10, pp. 390-396, figs. 2).—This paper, based upon the studies of *Erbosoma pyricola* previously noted (*E. S. R.*, 35, p. 463), includes later observations and a brief discussion of control measures.

In the control work miscible oil, kerosene oil emulsion, and distillate emulsion were used at proper strengths with success in controlling aphids on the roots of young orchard trees. Carbon bisulphid injected into the soil in liquid form proved satisfactory both on young orchard trees and in the nursery although there is some danger to the trees in its use.

The box elder aphid (*Chaitophorus negundinis*), R. L. WEBSTER (*Iowa Sta. Bul.*, 173 (1917), pp. 95-121, figs. 12).—This account deals largely with biological studies of *C. negundinis*, a plant louse which quite generally infests the box elder, one of Iowa's common trees. In that State nearly all box elders are infested by the pest and often to such an extent that it becomes a great nuisance. It is particularly obnoxious in southwestern Iowa in 1909 and in 1910 was so abundant throughout the State that the box elder foliage was very light. Although the box elder (*Acer negundo*) is the only plant on which this species is abundant, the insect has been recorded by Sanborn on catalpa. It is recorded as occurring from Manitoba and Ontario in the north south to Las Vegas, N. Mex. and from New York in the East and California in the West, though most abundant in the States of the Upper Mississippi Valley. It appears to be a native species, having been originally described by Thomas from Illinois in 1878.

The egg, in which stage the winter is passed, hatches early in the spring just as the box elder buds are ready to burst and on which the young soon begin to feed. Early in June or even late in May normal forms give birth to dimorphs and from then on, during July and August, only the dimorphic forms are generally found on the leaves. The author has observed the dimorphs to molt twice, after which they become normal forms that become active late in August or early in September, and when mature give birth to normal forms. It is pointed out that the presence of these dimorphs in midsummer accounts for the fact that for about three months but little damage is done to box elders, the dimorphs remaining on the leaves, entirely inactive. Due to this fact it is very difficult to

control the plant lice by spraying infested trees when only the dimorphs are present since they lie so flat on both the upper and lower surfaces of the leaves that it is difficult to reach any large percentage of them with the spray. The true sexes appear in October and eggs are deposited on the bark, twigs, and branches of the trees. Observations of 12 generations are recorded, the dimorphs having first appeared in the fourth and in the four succeeding. It is thought that under normal conditions there are six or seven generations including a generation of dimorphs in midsummer. Technical descriptions are given of the several forms.

Synalld flies are its most important natural enemies, two species, *Allograpta aphidivora* and *Syrphus americanus*, having been common at Ames in 1912. The larva of an agromyzid species (*Leucopis* sp. near *griseola*) and a cecidomyiid (*Aphidoletes* sp.) were observed by the author to feed upon this aphid. Among other predaceous enemies observed are several species of lady beetles (*Hippodamia convergens*, *Cycloneda sanguina*, *Adalia bipunctata*, and *Seymnius americanus*), the insidious flower bug (*Triphleps insidiosus*), a capsid (*Plagiognathus annulatus*), chrysopid larvae (*Chrysopa nigricornis*, *C. plorabunda*, and *C. scutellata*), and a large red mite (*Rhyncholophus pilosus*). Hymenopterous parasites serve as important checks, *Praon coloradensis* having been the most common species, and *Aphidius polygonaphis* was reared.

Control measures recommended include the use of blackleaf 40 (1:500) in the early spring against the eggs on the bark; and 6½ per cent kerosene emulsion or whale-oil soap (1:10) against the plant lice on the leaves when abundant in May and September. Since only the dimorphs are present during the summer, the spraying must be done before June or after September 1.

A list of 24 references to the literature is appended.

Aphis immunity of teosinte-corn hybrids. W. R. GERNERT (*Science*, n. ser., 5 (1917), No. 1190, pp. 390-392).—The data here presented relate to first generation hybrid plants from seed produced by fecundating teosinte (*Eulalia mexicana*) with pollen of yellow dent corn (*Zea indentata*), which species hybridize freely. The author observed that whereas both the roots and foliage of corn plants were heavily infested with aphids, no aphid was ever discovered upon either the teosinte or hybrids nearby.

Chermesidae in relation to British forestry. H. M. STEVEN (*Trans. Roy. Scot. Entom. Soc.*, 31 (1917), pt. 2, pp. 131-155, pls. 4, figs. 4).—A summary of information on this family in which particular attention is given to their life history.

The fluted scale (*Icerya purchasi*). E. R. SPEYER (*Dept. Agr. Ceylon Leaflet* 5 (1917), pp. 4, fig. 1).—A summary of information on the cottony cushion scale in Ceylon.

***Icerya purchasi* in Ceylon: A warning to India.** T. B. FLETCHER (*Agr. Ind. India*, 12 (1917), No. 4, pp. 525-531, pl. 1).—The discovery of the cottony cushion scale in Ceylon in December, 1915, an account of which has been noted above, and its rapid spread on *Acacia* spp. and citrus, together with the possibility of its introduction into India, have led to the preparation of this account.

A list of 36 titles to the literature consulted or quoted is included.

Studies on the morphology and susceptibility of the eggs of *Aphis avenae*, *A. pomi*, and *A. sorbi*. A. PETERSON (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 558-569).—This is a report of studies made at the New Jersey Experiment Stations.

A series of experiments conducted with various insecticides and other chemicals, briefly summarized, shows conclusively that the eggs of these three species are susceptible to various insecticides, particularly lime-sulphur and lime-sulphur combined with nicotine, and that they are also susceptible to various chemicals not generally used as insecticides. Orchard experiments with lime-sulphur

(1:9) and lime-sulphur (1:9) combined with blackleaf 40 (1:500) gave the results in killing eggs of *A. avenæ* and *A. sorbi* when the spray was applied as the buds started to swell, March 31 to April 7.

Some Florida scale insects, C. E. WILSON (*Quart. Bul. Plant Bd. Fla.*, 1 (1917), No. 1, pp. 2-65, figs. 70).—Brief descriptions are here given of 9 species of Coccidæ found in Florida, together with their host plants and distribution in the State. Photographic reproductions of most of the species are included.

Control of scale insects or Coccidæ in Florida, E. W. BERGER (*Quart. Bul. Plant Bd. Fla.*, 2 (1917), No. 1, pp. 66-81).—A summary of information and control measures for Coccidæ in Florida.

Oenaria dispar in Britain, R. ADKIN (*Proc. So. London Ent. and Nat. Hist. Soc.*, 1916-17, pp. 1-6).—This paper reviews the history of the occurrence of the gipsy moth in Great Britain, where it has been introduced several times. In some unknown way its extinction has resulted, and it is significant that *O.* and another species (*Chrysophanus dispar*) have disappeared from the local districts, so far as has been gathered from known records, within a year or two of one another.

The life history of the okra or mallow caterpillar (*Cosmophila erosa*) H. L. DOZIER (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 536-542, pls. 2).—This is a report of biological studies at Gainesville, Fla., of *C. erosa*, an annoying pest by Chittenden under the name *Abutilon* moth has been previously noted (E. S. R., 30, p. 157).

It is said to be a source of serious damage to okra, and to injure the cotton rose (*Hibiscus mutabilis*) and the flowering maple (*Abutilon striatum*) at Gainesville through attacking the leaves. Thirty-four days were found to be required for the completion of its life cycle.

The pink bollworm in Brazil, E. C. GREEN (*Bol. Agr. [Sao Paulo]*, 13, No. 7 (1917), pp. 583-606, figs. 13).—A summary of information on *Gelenk* *Pectinophora gossypiella*, which appeared in Brazil in 1914, and means for combating it. It now occurs over large areas in Parahiba, Rio Grande do Norte, and Ceara.

Note on the life cycle of the sugar beet webworm, H. O. MARSH (*Jour. Econ. Ent.*, 10 (1917), No. 6, 543, 544).—This note supplements the author's paper on *Loxostege sticticalis*, previously noted (E. S. R., 27, p. 861).

The Indian meal moth, *Plodia interpunctella*, in candy and notes on its life history, W. B. HERMS (*Jour. Econ. Ent.*, 10 (1917), No. 6, p. 563).—The author reports the thorough infestation of chocolate-coated marshmallow candy by the larvæ of *P. interpunctella* at San Francisco, Cal. The pest requires 23 days at a temperature of from 23 to 26° C. (73.4 to 78.8° F.) to complete its life history.

A demonstration in mosquito control, C. W. HOWARD (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 517-521).—This is a report upon a successful antimosquito campaign conducted at Minneapolis, Minn.

A trematode parasite of anopheline mosquitoes, J. A. SINTON (*Indian J. Vet. Med. Research*, 5 (1917), No. 1, pp. 192-194, pl. 1).—A parasite found in *Anopheles funestus listoni*, *A. culicifacies*, and *A. stephensi* which seems to be similar to the *Agamodistomum* described by Martirano¹ in *A. claviger* and to a similar parasite described by Alessandrini in *A. maculipennis* (E. S. R., 23, p. 653) is here described.

¹ *Pollicin.*, Sez. Prat., 7 (1901), No. 35, pp. 1089-1091, figs. 5.

[18.]

Asphondylia websteri n. sp., E. P. FELT (*Jour. Econ. Ent.*, 10 (1917), No. 6, p. 322).—A cecidomyiid which has been found to occur in an isolated area in the vicinity of Tempe, Ariz., and was previously reported to be the European species *A. miki* (E. S. R., 27, p. 161) is here described as new.

Hypoderma lineata in Netherlands, F. BAUDER (*Tijdschr. Diergeneesk.*, 43 (1916), No. 23, pp. 881-889, pls. 4).—A report of observations of this warble fly in the Netherlands.

The effect of certain chemicals upon oviposition in the house fly (*Musca domestica*), S. E. CRUMB and S. C. LYON (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 12-26, fig. 1).—Experiments conducted by the authors during the summer of 1916 gave positive evidence that carbon dioxide was the oviposition stimulant. A limited series of experiments with ammonia gave negative results. Since the results do not agree with those of Richardson (E. S. R., 37, p. 159), a careful analysis of his experiments have led the authors to conclude that the apparent discrepancy between his results and theirs is only in the conclusions drawn.

Studies in flies.—Classification of the genus *Musca* and description of the Indian species, P. R. AWATI (*Indian Jour. Med. Research*, 5 (1917), No. 1, pp. 65-131, pls. 10).—A continuation of the studies previously noted (E. S. R., 37, p. 170).

The carriage of cysts of *Entamoeba histolytica* and other intestinal protozoa and eggs of parasitic worms by house flies, with some notes on the resistance of cysts to disinfectants and other agents, C. M. WENYON and F. W. O'CONNOR (*Jour. Roy. Army Med. Corps*, 28 (1917), No. 5, pp. 522-527).—In feeding experiments with flies (*Musca*, *Fauna*, *Calliphora*, and *Lucilia*) the authors have confirmed the results of Kuenan and Swellengrebel,¹ and show that the cyst stage of *E. histolytica*, the species which causes amebic dysentery, may be ingested when infected feces are fed upon. They have also demonstrated that the larger cysts of the nonpathogenic human ameba *E. coli* and of the flagellate *Lamblia intestinalis* are ingested in a similar manner. Cysts of all three species were found in the intestine 24 hours after the last feeding on feces, but after this time they had been discharged from the intestine.

The passage of living and active *Trichomonas* through the flies' intestines was observed. The unaltered and living cysts commenced to be deposited in droplets of liquid feces within 20 to 30 minutes after the fly has fed on infected feces. In the droppings of 15 wild house flies captured at random were found not only the cysts of *E. histolytica*, *E. coli*, and *L. intestinalis*, but also the oöcyst of a coccidium and the eggs of various parasitic worms (*Tenia saginata*, *Ankylostoma duodenale*, *Trichocephalus trichiurus*, *Heterophyes heterophyes* and the comparatively enormous lateral-spined egg of *Bilharzia*).

Brain tests of their viability show that while the cysts of *E. histolytica* do not survive drying they are fairly resistant if kept moist. Cresol 1:40 or 1:50 was found to destroy them.

On a new nematode, *Aproctonema entomophagum* n. g. and n. sp., which parasitizes a dipterous larva, D. KELLIN (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 12, pp. 399-401, figs. 6).—This new nematode is a parasite of the larva of *Sciara pullula*.

What determines the duration of life in Metazoa? J. LOES and J. H. NORTHOPE (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 5, pp. 382-386).—In the authors' experiments with the pomace fly the ratio of the duration of the life of the insect to the duration of the larval, pupal, and imago stages was found to be approximately constant for all temperatures, and the same was true for the ratio of the larval to the pupal stage.

¹Centr. Bkt. [etc.], 1. Abt., Orig., 71 (1913), No. 5-7, pp. 378-410, pls. 2, figs. 15.

Carabidæ injurious to fruit trees, P. LESNE (*Rev. Hort. [Paris]*, 89 (1917) No. 18, pp. 283, 284, figs. 2).—A brief summary of information on injurious carabid beetles.

The phylogeny of the Elateridæ based on larval characters, J. A. HICKS (*Ann. Ent. Soc. Amer.*, 10 (1917), No. 3, pp. 241-263, figs. 9).

Sweet potato root weevil (*Cylas formicarius*), W. NEWELL (*Quart. Ex. Plant Bd. Fla.*, 2 (1917), No. 1, pp. 81-100, figs. 2).—A summary of information on this pest, which appears to infest the entire east coast strip of territory as far north as Daytona, Volusia County.

Shot-hole borer of tea [*Xyleborus fornicatus*], E. R. SPEYER (*Dept. Agr. Ceylon Leaflet* 4 (1917), pp. 4, pl. 1).—A popular summary of information.

Biology of the Tephrosia weevil, P. VAN DER GOOT (*Meded. Proefstat. Midden Java*, No. 26 (1917), pp. 36, pls. 2, figs. 2).—An extended account of studies of the coffee bean weevil (*Aracocerus fasciculatus*), its parasitic enemies, and control measures. This weevil is an important enemy of *Tephrosia candida* in Java.

The toxicity of molds to the honeybee and the cause of bee paralysis, G. TURESSON (*Svensk Bot. Tidskr.*, 11 (1917), No. 1, pp. 16-38).—Investigations of the cause of bee paralysis by the author led to the conclusion that it is due to molds which infest poorly constructed hives. This contention has been proved through feeding cultures of fungi, two of which species (*Penicillium* sp. and *P. stoloniferum*) were obtained from the intestines of dead bees and the others obtained from honeycombs.

"*Penicillium* sp., *P. stoloniferum*, and *Cladosporium herbarum* seem to have about the same degree of toxicity to bees and were all inferior in virulence to *P. conditaneum* and *Mucor*. . . . The climate has undoubtedly something to do with the different degrees of virulence in the molds, those of warm climates being far more toxic than those of temperate climates. This would also explain why bee paralysis is much more prevalent and virulent in warm than in cold climates."

The injury is probably a phenol intoxication. "The symptoms of poisoning are on the whole the same irrespective of the mold employed in the feeding experiments." The action is at first a stimulating one, followed by paralysis and the death of the bees. Bees fed with pure honey as controls confirmed the finding from the mold material.

The wintering of bees in Ontario, M. PETTIT (*Ontario Dept. Agr. Bul.* 15 (1917), pp. 24, figs. 14).—A popular discussion of the subject in which it is shown that if properly handled bees may be wintered successfully in any part of Ontario either in cellars or outdoors.

Money in bees in Australasia, TARTLTON-RAYMENT (*Melbourne and London Whitcombe & Tombs, Ltd.*, [1917], pp. XVI+293, pl. 1, figs. 100).—A guide to beekeeping in Australasia.

Notes on Bombidæ and on the life history of *Bombus auricomus*, T. H. FRISON (*Ann. Ent. Soc. Amer.*, 10 (1917), No. 3, pp. 277-286, pls. 2).—The studies of the life history and bionomics of *B. auricomus*, here reported, were made in central Illinois, where the species does not occur very commonly. The observations of the bumblebees supplement those of Sladen, previously noted (*E. S. R.*, 28, p. 562). The parasitism of a worker (*B. auricomus*) by *morra*, Rapides Parish, La., is recorded.

Occurrence of a fungus-growing ant in Louisiana, T. H. JONES (*Jour. Econ. Ent.*, 10 (1917), No. 6, p. 561).—The occurrence of *Atta texana* at Grosse morra, Rapides Parish, La., is recorded.

A contribution to the knowledge of the Platygasterinæ and their life history. KIEFFER (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1917), No. 24-25, pp. 547-57; abs. in *Rev. Appl. Ent., Ser. A*, 5 (1917), No. 7, p. 319).—This is a systematic paper with keys to the various genera and species, in which a considerable number of species reared from cecidomyiid hosts are described as new. [New Ichneumonoidæ], A. A. GIRAULT (*Psyche*, 24 (1917), No. 3, pp. 88-91).—Several papers by the author are here presented, namely, The North American Species of Pachyneuron, with Three New Species (pp. 88-90); New Loricaceous Chalcid Flies from North America (pp. 91-93); A New Species of the Genus Mymar from the Woods of Maryland with an Important Descriptive Note (pp. 99, 100); A Metallic Species of Cirrospilopsis from Maryland (p. 100); A New Species of Closterocerus from California (p. 101); and A New Genus or Subgenus of Pachyneurine Chalcid Flies (p. 102), namely, *Pachyneuronella*.

Records are made in the second paper (pp. 91-99) of the rearing of *Pachyneuron virginicum* Girault from viviparous females of *Aphis sorbi* on apple at Lakesburg, Va.; of *Dibrachys elisiocampa* (Fitch) from the larva of the potato tuber worm at Pasadena, Cal.; of *Polynema bifasciatipenne varium* n. sp. from the eggs of *Ecanthus* sp. in Kansas; of *Anaphoidea conotrachelii* Girault from the eggs of the grape curculio in West Virginia; of *Eutelus ruber* n. sp. from *Cecidomyia betula* at Albany, N. Y.; of *Aphidencyrthus opuntiae* Girault from the oyster-shell scale at Monmouth, Me.; etc.

Chalcididæ of the wild fig tree in India, Ceylon, and Java, G. GIRAUDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 11 (1917), pp. 183-184, figs. 20; 12 (1917), pp. 3-60, figs. 22; abs. in *Internat. Inst. Agr. [Rome]*, *Bol. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 4, p. 664).—This consists of systematic description of the chalcidids found to occur in the fruit of the *Ficus* spp.).

New chalcid flies, with notes, A. A. GIRAULT (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 4, pp. 86-89).—Among the seven species here described as new are *Mydionota lividicarpus*, reared from the pistol case bearer, which occurs in several localities in California, and *Eurytoma pissodis*, reared from *Pissodes* spp. at Taylors Falls, Minn.

Eight new species of reared ichneumon flies with notes on some other species, R. A. CUSHMAN (*Proc. U. S. Nat. Mus.*, 53 (1917), pp. 457-469).—The flies here described as new are said to have been reared by agents of the Bureau of Entomology of the U. S. Department of Agriculture, and the majority of them to be represented by a considerable series.

The new species are *Bathythrix tibialis*, probably a secondary parasite of *Imetastegia glabrata* at Wenatchee, Wash.; *Aenoplex nigrosoma*, *Cacnocyrtus excomeri*, and *Chaeretymma minuta* reared from *A. glabrata* at Wenatchee, Wash.; *Spilocryptus polychrosidis* from the grape berry moth at North East, Wash.; *Scambus ephialtoides* from *Evetria siskiyouana*, at Colestin, Siskiyou, and Ashland, Oreg., Corlett, Mont., and Crescent City, Cal.; *Hiopectis obesus* from the fruit tree leaf roller and bud moth at Wenatchee, Wash.; and *Glypta tetrica* from *Evetria taxifoliella* from Ashland, Oreg., and Missoula, Mont.

(Trypidae) *Microcryptus osculatus* has been reared in considerable numbers from the larvae of *A. glabrata* at Wenatchee, Wash.; *Aenoplex plesiotypus* has been reared from the codling moth at Wenatchee, Wash., and Vienna, Va.; and *Carpocapsa* is recorded as having been reared from *Enarmonia caryana* at Marietta, Ga.

Three new chalcid flies from North America, A. A. GIRAULT (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 4, pp. 85, 86).—One of the species here described as

new (*Elachistus sanninoides*) was reared from the pupa of the peach borer at Fayetteville, Ark.

Wolffella ruforum n. g. and n. sp., a chalcid parasite of the eggs of *Lophyrus rufus* in Germany, A. KRAUSSE (*Ztschr. Forst u. Jagdw.*, 49 (1917), No. 1, pp. 26-35; abs. in *Internat. Inst. Agr. [Rome], Internat. Rev. Exp. Agr. Pract. Agr.*, 8 (1917), No. 4, p. 665).—The eggs of *L. rufus* collected from peach needles were found to be highly parasitized by *W. ruforum*, here described as representing a new genus and species.

New parasite cages, C. E. PEMBERTON and H. F. WILLARD (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 525-527, pl. 1).—The authors describe improved cages made use of during the course of studies of introduced braconid parasites of the Mediterranean fruit fly in Hawaii.

The biology of *Cœlinidea meromyza*, E. O. G. KELLY (*Jour. Econ. Ent.*, 10 (1917), No. 6, pp. 527-531).—This is a brief summary of information on *meromyza*, a parasite of the wheat bulb worm (*Meromyza americana*), of which there are but few references in the literature.

The author finds that this parasite oviposits in the eggs of this host and that apparently there are two annual broods and an extra brood in case there is an extra host brood. The examination of a number of infested plants collected in 1914 and 1915 led him to conclude that the percentage of parasitism is not sufficient to have a controlling influence on the host.

The *Latrodectus mactans* and the *Glyptocranium gasteracanthoides* in the Department of Arequipa, Peru, E. ESCOMEL (*New Orleans Med. and Surg. Jour.*, 70 (1917), No. 6, pp. 530-542, figs. 2).—"The *L. mactans* and the *G. gasteracanthoides* are two dangerous arachnids that exist in southern Peru. Their bite has caused cases of arachnidism with local and general symptoms resulting sometimes in death. The treatment with permanganate of potash internally and externally, is the one that has given the best results."

New tick records for Minnesota, C. W. HOWARD (*Jour. Econ. Ent.*, 10 (1917), No. 6, p. 560).—A male *Ornithodoros talaje* is recorded from Le Sueur and *Dermacentor albipictus* has become established at Itasca Park.

FOODS—HUMAN NUTRITION.

Nutrition investigations upon cottonseed meal.—III. Cottonseed flour. The nature of its growth-promoting substances, and a study in protein minimum, ANNA E. RICHARDSON and HELEN S. GREEN (*Jour. Biol. Chem.*, 61 (1917), No. 2, pp. 379-388, figs. 4).—Continuing previous work (*E. S. R.*, 38: 166), this article reports feeding experiments with rats to show the content in cottonseed flour of growth-essential factors other than protein and mineral matter, and reports the results of studies of the protein minimum of cottonseed flour. The following results are summarized:

Fifty per cent of cottonseed flour in the diet contains sufficient water-soluble food accessory for normal growth, but does not contain sufficient fat-soluble food accessory for normal growth, although 12 per cent of the ether extract appears quite as efficient in supplying enough of the fat-soluble accessory for normal growth as does an equivalent amount of butter fat. Eighteen per cent of cottonseed protein when supplied with adequate amounts of all other necessary nutritive factors induces practically normal growth and reproduction in rats but with high mortality in the second generation. Twelve per cent of cottonseed protein does not induce perfectly normal growth. Normal growth has not been obtained on 9 per cent of cottonseed protein, and very little growth has been obtained with 6 per cent of this protein. With only 4

per cent of cottonseed protein rats have lost weight but later maintained weight.

How to grow the cowpea and forty ways of preparing it as a table delicacy. G. W. CARVER (*Alabama Tuskegee Sta. Bul. 35* (1917), pp. 24, figs. 1-4).

This bulletin discusses the cultivation and uses of the cowpea, and gives forty tested recipes for preparing it for the table, also some remedies for its diseases and insect enemies.

The uses of the peanut on the home table. JESSIE P. RICH (*Bul. Univ. Tex., Agr. 1729* (1917), pp. 18, figs. 3).—This bulletin includes a discussion of the food value of this legume and ways of preparing it for home use.

The biological efficiency of potato nitrogen. MARY S. ROSE and LENNA F. COLE (*Jour. Biol. Chem., 30* (1917), No. 2, pp. 201-204).—The experiments reported in this article demonstrate that the potato is a source of nitrogen compounds of high nutritive efficiency in spite of the fact that only 63 per cent of the potato nitrogen is reported to be in the form of protein.

Burnt grain or flour. (*Sci. Amer. Supp., 83* (1917), No. 2162, p. 367).—Milling and baking tests with wheat and flour which had suffered from fire in a grain elevator at Mans, France, were made by E. Vidlere and indicated that exposure of the milled product to the air lessened the burnt odor. Bread made from the flour varied from good tasting to disagreeable, but, in general, was said to be of fair quality.

The wheat increased in density due to the drying effect of the fire, resulting in a proportion of 1:1.13. Five per cent of the grain was carbonized. Flour made with fresh bran, 50 parts of flour to 25 of bran, and left in contact for ten days at 20° C., then bolted, was found to be deodorized.

Bread and bread making. NORMA J. DAVIS (*Agr. Ext. Univ. Nev. Bul. 12* (1917), pp. 15).—This bulletin gives a short history of the use of bread and discusses the physics and chemistry and the mechanics of bread making. Instructions for making bread are taken up in a series of lessons covering both quick breads and yeast breads. Some recipes are included.

The chemistry of bread making. C. H. LAWALL (*Trans. Wagner Free Inst. Sci. Phila., 8* (1917), pp. 77-95).—The author discusses the different types of bread and their use. The chemical changes normally occurring in bread making—the leavening of bread by mechanical aeration, by the use of chemicals, and the bacterial action as in salt-rising bread, are described. The chemical changes that arise from the use of adulterants of bread are also noted.

Making sauerkraut. A. T. ERWIN (*Iowa State Col., Agr. Ext. Dept., Emergency Leaflet 24* (1917), pp. 2).—This leaflet gives directions for making and storing sauerkraut.

Essentials in the selection of beef. W. C. COFFEY and E. K. AUGUSTUS (*Illinois Sta. Circ. 206* (1917), pp. 16, figs. 17).—This circular includes a description of the cuts of beef, their relative economy, and general methods of cooking.

Sanitary inspection of slaughterhouses. J. O. LABACH and W. H. SIMMONS (*Kentucky Sta. Bul. 209* (1917), pp. 137-167, fig. 1).—The bulletin consists largely of the text of the sanitary regulations for the killing, handling, and sale of meat and meat products in Kentucky, the results of the inspection of slaughterhouses during 1916 and 1917, and an illustrated description of Kentucky sanitary privy.

Manual of military cooking, 1916 (*Ottawa: Govt., 1916, pp. 68, figs. 24*).—This book contains information concerning the duties of the officers of the mess, gives descriptions of messing arrangements and apparatus, and includes a statement of the British Government Army ration and many recipes.

This book contains essentially the same material, with some additional figures showing the use of camp cooking devices, as that given in the *British Manual of Military Cooking*.¹

New Mexico cookery, ALICE S. TIPRON (*Santa Fe, N. Mex.: State, Land Og.* 1916, pp. 64).—This booklet gives directions for the preparation of certain New Mexican dishes from the native food products, including the use of New Mexican chili, herbs and garlic, olive oil, hulled corn and meal, and the pinto or frijole bean.

Comparative statistics on foodstuffs and fuel for four years as shown in a budget of the annual cost of living of a family of five persons, C. H. YOUNGER (*Olympia, Wash.: State Bur. Labor, 1917, pp. 3*).—A table showing the annual cost of foodstuffs and fuel for a family of five for the years 1914, 1915, 1916, 1917 in Seattle, Tacoma, Spokane, and the State of Washington exclusive of these large cities is given.

The rôle of vitamins in the diet, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 31 (1917), No. 1, pp. 143-163, figs. 4).—This article discusses the work of Röhmman, who has taken vigorous exception to the vitamin hypothesis. The authors cite experiments to prove the necessity for at least two formerly unappreciated components of the adequate dietary. These occur in natural foods.

"Despite the success which has attended the use of yeast as an adjunct to otherwise inadequate food mixtures, notably in the case where casein or casein hydrolyzate furnished the bulk of the protein, such yeast-containing 'artificial' food mixtures have not yet demonstrated a nutrient efficiency equivalent to that manifested through the use of 'protein-free milk' or certain other naturally occurring food products like cottonseed meal. The refusal of some rats to eat an adequate amount of the yeast-containing foods has proved a stumbling block to exact comparisons. Although some of the animals brought up on the yeast-containing foods have given birth to young, thus far none of the litters have been reared."

The "vitamin" hypothesis and deficiency diseases.—A study of experimental scurvy, E. V. McCOLLUM and W. PITZ (*Jour. Biol. Chem.*, 31 (1917), No. 1, pp. 229-253, figs. 11).—"The observations reported in this paper furnish definite support for the idea that scurvy in the guinea pig is not the result of the deficiency of a specific protective substance. . . . The first case of the disease is associated with the retention of feces owing to diets of unfavorable physical character and debility of the digestive tract through stretching and contact with irritating and toxic putrefaction products of bacterial origin."

The authors provisionally adopt the view "that unfavorable properties among the well-recognized constituents of the diet as well as of the two but recently appreciated ones, together with unsatisfactory physical factors and injury wrought through the agency of microorganisms inhabiting the alimentary tract, will account for all the observed types of pathological functioning which are associated with the deficiency of a specific substance (water-soluble B) in the diet."

The authors agree with Funk that polyneuritis is caused by a deficiency of a specific substance (water-soluble B) in the diet.

"Since diets containing liberal amounts of butter fat (fat-soluble A) permit the development of scurvy, rickets, and polyneuritis, there would seem to be but one syndrome, pellagra, which one might possibly refer to a shortage of this second unidentified dietary factor. There is, however, not the slightest

¹ London: Govt., 1910, reprinted 1915, pp. 82, pl. 1, figs. 3.

evidence that there is any reason to attribute pellagra to this cause. Of the profound importance of proper amounts and relationships of the inorganic constituents of the diet our published results have furnished many examples. This, together with proteins of poor quality taken regularly at low planes, and an inadequate supply of fat-soluble A, has contributed to nutritive failure in all diets described by Goldberger and his associates as being employed by peoples where the incidence of pellagra is high."

A bibliography is appended.

The nutritive value of the diamino acids occurring in proteins for the maintenance of adult mice, E. M. K. GEILING (*Jour. Biol. Chem.*, 31 (1917), No. 1, pp. 173-199).—The experiments reported were all conducted with adult mice for the purpose of ascertaining whether or not the diamino acids, arginin, lysidin, and lysin, which are precipitated with phosphotungstic acid in acid solution, are necessary for the maintenance of adult mice. The following findings are among those summarized:

"If the diamino acids are removed from hydrolyzed casein with phosphotungstic acid in acid solution, the residual amino acids are inadequate for the maintenance of adult mice. . . . Cystin appears to be necessary for the maintenance of adult mice. Arginin and histidin seem to be interchangeable in nutrition. Full-grown mice are able to hold their weight when either of them, together with systin, is present in the ration. In the absence of both, loss of weight results. . . . Lysin does not appear to be necessary for the maintenance of adult mice."

A bibliography is appended.

Influence of protein intake on creatin excretion in children, W. DENIS, J. G. KRAMER, and ANNA S. MINOR (*Jour. Biol. Chem.*, 30 (1917), No. 2, pp. 189-196).—Experimental results are presented on four children and one infant in which it is shown that the amount of creatin found in the urine of children is directly dependent on the intake of protein, being high when large quantities of protein (creatin-free) are ingested, decreasing and in some cases disappearing entirely when the child is fed a diet of an extremely low protein content. Creatinuria in normal children is therefore due to the relatively high protein intake which is the rule with practically all children; that it may also be due to the low saturation point of immature muscle is suggested by the small creatin content of the muscles of children and by the relatively low level of protein consumption at which appreciable quantities of creatin are excreted."

Bence-Jones proteinuria.—Some observations on its occurrence, with particular reference to nephritis and hypertension, S. R. MILLER and W. A. BAETZ (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 3, pp. 137-139).—This article reviews the investigations and theories of several workers in regard to the general subject of Bence-Jones proteinuria and cites several new cases.

"Bence-Jones protein apparently may occur in seemingly healthy young persons in whom it may be discovered accidentally. In the cases reported, there were, in addition, hypertension and cylindruria, despite functional renal tests which were in all respects normal. These cases may be strong additional proof of the theory that Bence-Jones proteinuria is an inborn error or anomaly of metabolism. . . ."

"It seems obvious that the association of Bence-Jones proteinuria, hypertension, and nephritis is probably not uncommon, and the chances are that attention called to this matter will result in the finding of more cases."

Studies in calcium and magnesium metabolism.—I-III, M. H. GIVENS and B. MENDEL (*Jour. Biol. Chem.*, 31 (1917), No. 2, pp. 421-433, 435-439, 441-444).—Three studies are reported.

I. *The effects of base and acid.*—"Administration of base or acid produced no significant effect upon the balance of nitrogen, calcium, magnesium, and phosphorus in the dog. Administration of hydrochloric acid increased the urinary excretion of calcium and thereby altered the relation of calcium to magnesium in the urine. The calcium contained in milk was more effective than soluble calcium lactate in producing calcium retention. Administration of large doses of alkali bicarbonate to a human diabetic did not decrease the urinary output of calcium."

II. *The effect of diets poor in calcium.*—This article gives experimental data which show that diets poor in calcium are not conducive to a positive calcium balance even when an abundance of nitrogenous food is available.

III. *The effect of fat and fatty acid derivatives.*—This article discusses the experimental feeding of dogs to show the relation of fat and fatty acid derivatives upon the utilization of calcium and magnesium. "It is evident from the data presented that poor utilization of fats or fatty acids may increase the excretion of lime in the feces and prevent the storage of calcium even when the calcium intake is comparatively abundant."

The metabolism of sulphur.—II, The influence of small amounts of cystin on the balance of nitrogen in dogs maintained on a low protein diet. H. B. LEWIS (*Jour. Biol. Chem.*, 31 (1917), No. 2, pp. 563-577, fig. 1).—Continuing previous work (E. S. R., 35, p. 863), experimental feedings of dogs maintained on standard diets of low protein content but of ample calorific value and given small amounts of cystin are reported. The conclusion is reached "that the addition of small amounts of cystin to the diet of dogs on a low protein diet diminished the loss of nitrogen from the body and favorably influenced the nitrogen balance. This is interpreted to be the result of a specific demand for cystin for metabolic purposes, since tyrosin and glycocholi added to the diet under like conditions of experimentation did not diminish the nitrogen loss or influence the condition of nitrogenous equilibrium."

A study of the effect of hydrochloric acid on the mineral excretion of dogs, R. L. STEHLE (*Jour. Biol. Chem.*, 31 (1917), No. 2, pp. 461-470, figs. 6-8).—The conclusions reached by this experiment are that "the administration of hydrochloric acid by mouth to the dog causes an increased excretion of calcium and magnesium, as well as of sodium and potassium, but in the case of the latter pair a compensatory retention makes the loss apparent rather than real. If an analogous condition holds in human diabetes, the resulting calcium loss may be something to take into consideration in the treatment of diabetic patients in whom the excretion of hydroxybutyric acid has reached a significant figure."

ANIMAL PRODUCTION.

The nutritive properties of kafirin, A. G. HOGAN (*Jour. Biol. Chem.*, 33 (1918), No. 1, pp. 151-159, figs. 4).—The author reports the results of feeding experiments with kafirin, the chemical examination of which has been previously noted (E. S. R., 37, p. 8). Rats were used as the experimental animals.

A basal diet in which kafirin formed the sole source of protein supply resulted in nutritive failure. The addition of gliadin barely sufficed for maintenance. Gelatin caused a slight growth which became more rapid with a combination of gelatin and gliadin. This led to the assumption that lysin is the first limiting factor in kafirin, the second being tyrosin, cystin, or tryptophane. To test this the amino acids mentioned were added singly and collectively to the basal rations. Experimental data confirmed the assumption that lysin is the first limiting factor and seem to show that cystin is the second.

The author states that the data bring out one fact of general application, that lysin is indispensable even for the maintenance of young animals. The literature on this subject is reviewed.

The soft corn problem, J. M. EYVARD (*Iowa Sta. Circ. 40 (1917), pp. 8*).—The situation of soft corn is a problem that confronts the Iowa farmer especially in backward seasons or in case of an early frost. This circular discusses methods of employing such corn to the greatest profit.

The silo is deemed the most satisfactory storage for soft corn. It may be shocked, using the entire plant or only the ears. Shocking will help to save the cover, that of soft corn being of high quality. Cribbing is generally used when the corn runs from 25 to 30 per cent of moisture. Shredding is usually unsatisfactory as the excess moisture in soft corn causes it to spoil in storage. The marketing of soft corn should be done while it is in a frozen state. Feeding soft corn is the logical disposition to make of it. Hogs and cattle can dispose of it with least danger. If moldy it is considered dangerous for horses and young sheep.

The composition, digestibility, and feeding value of pumpkins, J. B. LEXERY (*Massachusetts Sta. Bul. 174 (1917), pp. 55-71*).—In four analyses of pumpkins grown in two seasons the average water content was 87.53 per cent, crude protein 1.92, fat 1.49, fiber 1.84, extract matter 6.25, and ash 0.96 per cent. The dry matter contained more protein than roots or grain, with a portion of it in the amido form. Of nearly 18 per cent of sugar $\frac{1}{2}$ was in the form of cane sugar. Nearly all the fat was contained in the seed.

Two digestion trials were made during successive seasons with two sheep in each case, the details to be published elsewhere. The dry matter of the pumpkin was about 81 per cent digestible, which is estimated to be about 20 per cent greater feeding value than mangels and turnips.

An experiment was made to test the value of pumpkins as a feed for dairy cows. Two cows were fed hay, bran, cottonseed meal, and hominy meal through three periods of 21 days each. In the second period 5 lbs. of the hay was replaced with 30 lbs. of the cut pumpkins, which contained 1 lb. more of digestible matter than the hay. The yield of milk was substantially the same. The total solids, evidently due to an increase in the percentage of fat in the milk, increased with the pumpkin ration. The results indicate that from 5 to 6 lbs. of pumpkins was equal in food value to 1 lb. of hay.

Prickly-pear stock feeding experiments at Wallumbilla (*Queensland Agr. J. ser. 7 (1917), No. 2, pp. 62-70, figs. 18*).—These experiments were carried out to test the value of prickly pear as a cattle feed, how to feed and the amounts, the water requirements where pear is fed, and the physiological effect of the diet.

The trials were carried on for six months with 18 young bullocks. The animals had to be gentled and taught to eat the pear, and some lost as much as 80 lbs. before becoming used to the feed. None of the animals fed exclusively on pear consumed more than 90 lbs. daily, and on the average maximum of 62 lbs. per day they obtained insufficient nutriment to maintain life for more than limited periods. With the addition of from 3 to 3.5 lbs. of lucerne chaff or from 2 to 2.5 lbs. of linseed cake to the ration the animals gained during the coldest months $\frac{1}{2}$ lb. per day, and during warmer weather some gained $\frac{1}{2}$ lb. per day and became fit for beef purposes. It was not necessary to singe the pears; passing them through a power-driven slicer made them fit to feed. Machine-sliced pear was as acceptable as boiled pear.

Two of the animals slaughtered to test the effect of an almost exclusive pear diet proved satisfactory for beef purposes and carried a light but even distribution of fat. The veterinarian's report found that with the exception of a

minor ulceration of the tongue, palate, and stomach there was no evidence of an unhealthy nature that might be attributed to the pear ration. It appeared that the mucous membranes of the digestive organs had become thickened as a result of irritation, but there were no lesions of a serious nature. There was no accumulation of fiber in the stomachs.

From the results of this experiment prickly pear seems to be a complete roughage and hay not required. During the cool weather the animals did not receive any water for 150 days, but when the warm weather set in they drank considerable quantities.

Prickly pear as cattle fodder.—Experiments in Queensland (*Pastoral Rec.* 27 (1917), No. 5, p. 425).—A brief summary of the work noted above.

Oil cakes in the feeding of animals. A. GOVIN and P. ANDOUARD (*Jour. Agr. Prat.*, n. ser., 29 (1916), Nos. 12, pp. 214, 215; 13, p. 228; 14, pp. 241, 242).—This article treats of the feeding of oil cakes (peanut, coconut, sesame, and palm nut) to cattle, pigs, and horses. Where the prices will permit it may replace hay, oats, and other feeds in the usual ration. Its greater utilization is urged.

The principal place of the manufacture of oil cakes in France is Marseilles, peanut cake leading. The production of peanut cake in that city runs about 300,000 tons annually, but only about 250,000 tons were produced in 1915.

Commercial feeds. J. M. PICKEL and E. S. DEWAR (*Bul. N. C. Dept. Agr.*, 1 (1916), No. 11, pp. 55, fig. 1).—During the year 1916, 542 samples of feeds were analyzed, of which 401 were collected. Of the total number 29 per cent were below the guaranties while 14.7 per cent were substantially not so good as claimed by the manufacturer.

The feeding stuffs analyzed included wheat bran and middlings; shipstow red dog flour; mixed feeds with and without molasses; poultry feeds; cotton seed meal and feed; cracked corn, chop, and meal; beet pulp; calf meal; corn gluten feed; meat scrap; rice meal; peanut meal, cake, and offal; velvet bean meal; and soy bean meal.

A table of relative values of some concentrated cattle foods. O. T. FARMER (*Jour. Dairying [India]*, 3 (1916), No. 2, pp. 86-91).—Analyses, percentages of digestible nutrients, and energy values are given for the following feeds: Gram meal (*Cicer arietinum*), guar meal (*Cyamopsis psoralioides*), moth meal (*Phaseolus aconitifolius*), mash meal (*P. mungo*), mung meal (*P. radiatus*), and juar (*Andropogon sorghum*).

The equivalence of live stock foodstuffs and feeding rations. A. J. PERKINS (*Jour. Dept. Agr. So. Aust.*, 19 (1915), Nos. 2, pp. 142-157; 3, pp. 260-261; 4 (1916), Nos. 7, pp. 620-627; 10, pp. 900-905).—A summary of present knowledge of feeds and feeding with tables of analyses and feed values. A comparison is made of the prices of local rations with their estimated values. From prevailing conditions and supplies, rations for the various classes of live stock are proposed.

A study of the normal metabolism of the guinea pig. L. M. SMITH and H. B. LEWIS (*Jour. Amer. Chem. Soc.*, 39 (1917), No. 10, pp. 2231-2239).—The total nitrogen, ammonia, urea, creatinin, chlorids, phosphates, hydrogen-ion concentration, and total acidity of the urine of guinea pigs on diets of carrots and cabbage were determined.

Form and function, a contribution to the history of animal morphology. E. S. RUSSELL (*London: John Murray, 1916, pp. IX+383, figs. 15*).—This is a history of anatomy, in which the author seeks to show the continuity of animal morphology from Aristotle to the present time.

The currents of morphological thought are three—the functional or synthetic, the formal or transcendental, and the materialistic or disintegrative. "Is function the mechanical result of form, or is form merely the manifestation of function or activity?" The author is in sympathy with the functional attitude. Theories of evolution have blinded us to the questions of vital phenomena, and the opinion is hazarded that we will return to a simpler attitude toward the problems of animal form.

Embryology of the yellow mouse, W. B. KIRKHAM (*Abs. in Anat. Rec.*, 11 (1917), No. 6, pp. 480, 481).—Material from nonsuckling yellow mice representing embryonic stages of each of the first 19 days of pregnancy was compared grossly with similar material from nonsuckling white mice.

It was found that the rate of cleavage and of embryonic development is the same for yellow as for white mice. All of the observed two-cell stages of both yellow and white mice appear normal. No degenerating morulae or blastulae are found in white mice, while one or more were present in every yellow mouse containing embryos of that stage in development. The material covering the sixth to the seventeenth days of pregnancy yielded degenerating embryos in 8 out of 28 uteri in white mice and in 11 out of 13 yellow mice. If females that have stillbirths or that eat their new-born young are eliminated, the figures become more striking, degenerating embryos in white mice appearing in only 1 fetus out of 12 examined, while in yellow mice 11 out of 12 uteri contained them. No degenerating embryos were found in either white or yellow mice pregnant more than 16 days. [Apparently the author did not test genetically the white mice. It is possible that some of them carried the factor for yellow color.]

Evidence for the death in utero of the homozygous yellow mouse, H. L. HEN and E. STEIGLEDER (*Amer. Nat.*, 51 (1917), No. 612, pp. 740-752, fig. 1).—Data are presented substantiating the conclusions of Castle and Little (*E. S.* 1, 24, p. 475) and Kirkham (see above) that in mice homozygous yellow zygotes are produced in the yellow \times yellow mating, but that these zygotes fail to develop normally after implantation in the uterus. In the studies here reported 688 embryos were obtained from nonsuckling females pregnant from 13 to 19 days. These embryos were from the following matings: (1) Yellow \times yellow δ , (2) yellow \times nonyellow (chocolate) δ , (3) nonyellow (chocolate) \times yellow δ , and (4) nonyellow \times nonyellow δ . In this last mating most of the parents were self-blacks.

During the investigation two types of dead embryos were encountered, (1) those in which development had ceased shortly after implantation, and (2) a few which had died after apparently normal development of about 13 days. The average number of living embryos was less for the mating yellow \times yellow than for any of the other types of matings, singly or combined. In the yellow \times yellow matings the average of 33 litters was only 6.15, while for 49 litters of the other matings combined the average was 7.63. The average litter size when dead embryos are also included was 8.27 for yellow \times yellow and 8.47 for all other matings. Of living litters of mice born in the laboratory during the course of this investigation 140 litters from yellow \times yellow averaged 5.36 each and 180 litters from nonyellow \times nonyellow matings averaged 6.56 each.

In explanation of this failure of homozygous yellow zygotes to develop, it is suggested that in mice there may be a "lethal factor," similar to those so well known in *Drosophila*, which is so closely linked to the factor for yellow that they are practically at the same locus and there is consequently no crossing over.

The biology of twins. H. H. NEWMAN (*Chicago: Univ. Chicago Press*, 1917, pp. IX+186, pl. 1, figs. 55).—In this book the attempt has been made to gather from various sources the facts about mammalian twins and to unify these varied situations into one point of view. A detailed account is given of the facts revealed by the study of monozygotic twinning in the armadillo, and, in the author's opinion, this is the nearest approach at present possible to the direct study of twinning in mammals, and more especially of human twinning. The phenomenon of freemartinism in cattle is reviewed and its bearings on the problems of sex biology noted. The study of twins in relation to the following problems is discussed: (1) The time of and the mechanics of sex determination, (2) the significance of sex-ratios, (3) the mechanism of sex differentiation, (4) the inheritance of twinning, (5) modes of inheritance in monozygotic or polyembryonic twins, and (6) the nature and significance of symmetry reversals in monozygotic twins.

A mule and a horse as twins, and the inheritance of twinning. W. R. B. ROBERTSON (*Kans. Univ. Sci. Bul.*, 10 (1917), No. 15, pp. 293-298, pls. 4).—The author presents data in reference to the birth of a female mule and a male horse as twins. The year previous to the birth of these twins their dam, for 10 minutes before being bred to a jack, had been bred to a 3-year-old stallion. It is noted that this mare in the nine times she had produced foals had given birth to twins (mules) on two other occasions. In addition one of her single mare foals had produced twins (horses), and also her own half sister had produced twins. The inheritance of color in the twin offspring of this mare is discussed. Photographs of the mare and the mule-and-horse twins are reproduced.

Some breeding statistics. R. BRANFORD (*Agr. Jour. India*, 12 (1917), No. 4, pp. 573-578).—Brief notes are given on color inheritance in mules, asses, sheep, and cattle and sex ratios in cattle and asses. The data were obtained for the most part from breeding operations at the Government cattle farm at Hissar, India.

Receipts and shipments of live stock, 1916 (*Union Stock Yard and Transit Co. Chicago, Ann. Live Stock Rpt.*, 51 (1916), pp. 3-56).—This gives the receipts and shipments of live stock at the Union Stock Yards, Chicago, for 1916, with a summary of receipts and shipments and valuations of all live stock for a term of 51 years ended December 30, 1916.

Live stock slaughtered (*Jour. Agr. [New Zeal.]*, 15 (1917), No. 2, p. 119).—The following stock was slaughtered in New Zealand during the year ended March 31, 1917: Cattle, 328,708; calves, 19,396; sheep, 3,341,910; lambs, 3,411,621; and swine, 153,444. This showed an increase over the previous year of 20,403 head of cattle, and a decrease of 389,733 sheep, 653,479 lambs, 14,374 calves, and 16,271 swine.

Indo-China live stock; exports to France and the Far East. C. SARAGIN (*Bul. Écon. Indochine, n. ser.*, 19 (1916), No. 121, pp. 563-608).—A discussion of the live-stock industry in Indo-China with statistics of exports. The needs of the industry are discussed and methods proposed whereby it may be bettered and enlarged.

Inheritance of fertility in Southdown sheep. E. N. WENTWORTH and J. R. SWEET (*Amer. Nat.*, 51 (1917), No. 611, pp. 662-682).—The authors review the literature on inheritance of fertility in sheep and give results of a biometrical study of data obtained from flockbooks of the Southdown, Shropshire, Dorset, and Cotswold breeds.

It is concluded that "in general sheep of a high birth rank tend to produce offspring of a high birth rank. On the basis of the few data presented the

highest record of a ewe appears to be a better selection standard for high fecundity than a random record.

The frequency of multiple births in sheep varies with the breed. Physiological factors may exert a marked influence on heredity, the most important factors being the vigor of the ewe, the feeding of the ewe, the age of the ewe, the season, and the region. Apparently no relation exists between high fertility and additional mammae.

In pedigrees started from single births the birth rank of the sire does not affect the birth rank of the progeny; in pedigrees started from twin births the effect of high birth rank of the sire is only slightly significant (more than three times the probable error). The effect of birth rank of ewe on the birth rank of progeny is the same as that of the sire except in the case of pedigrees started from twin births, when it is slightly greater.

No evidence for a sex linkage of fecundity factors occurs in the pedigrees tabulated, as shown by a comparison of the relative influence of progeny of the maternal granddam and the maternal grandsire. Evidence from Shropshire triplet pedigrees suggests that triplets are genetically different from twins and singles, which two are probably genetically alike."

Hereditary transmission of the "curly wool" character of caracul sheep in crosses between the caracul and Rambouillet breeds, L. ADAMETZ (*Ztschr. f. d. tierärztl. Abstim. u. Vererbungslehre*, 17 (1917), No. 3, pp. 161-202; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 6, pp. 996-998).—In order to test the popular theory that the lock of caracul wools is a specific product of their native habitat and to gain a better knowledge of the inheritance of the curl, crossings between caracul and Rambouillet sheep were made at the agricultural high school at Gross-Enzersdorf, Austria. The results thus far secured indicate that the caracul curl is a strictly hereditary character which is transmitted even if caracul sheep are crossed with other races of which the lambs have wool which does not curl. With regard to this character, such crossings produce characteristic Mendelian segregations. The capacity of caracul sheep to form these typical locks is, therefore, a character which is never caused by the natural conditions of the Bokhara district, but is rather a phenomenon of domestication due to a mutation.

In the F₁ some of the animals have no curls, others have curls like those of the pure-bred caracul, and there are all kinds of intermediates, indicating incomplete dominance in the formation of curls. The varying behavior of the hairs which form the curl at the different stages of the development of the fleece leads to the supposition that there is a close relationship between curly, catlying hair on the one hand, and curly, vertical hair and very wavy and slightly wavy hair on the other. It is clear that the shape of the lower part of the follicle can not be the cause of this varying behavior of the hairs.

A flock of sheep on the farm, R. F. MILLER (*California Sta. Circ.* 184 (1917), pp. 7).—The decrease in sheep production and the increase in wool importations into the United States has caused the inauguration of a campaign for the improvement of sheep husbandry. This circular discusses the details of sheep raising under California conditions.

Prices of sheep and wool from 1818 to 1915 (*Trans. Highland and Agr. Soc. Scot.*, 5, ser., 28 (1916), pp. 277-280).—Annual prices are reported for Cheviot and Blackface sheep and for four classes of wool.

Pork production in Florida, J. M. SCOTT (*Florida Sta. Bul.* 141 (1917), pp. 55-56, fig. 1).—A revision and combination of Bulletins 113 and 131 (E. S. R., 28, p. 770; 35, p. 870).

The swine industry in New Jersey, with suggestions relative to the control of hog cholera, F. C. MINKLER (*N. J. Dept. Agr. Bul. 1* (1916), pp. 48-54, figs. 1-11).—A general treatise on hog breeding, feeding, and marketing. Hog cholera and the use of serum for its prevention is described.

Experiments with swine, 1916 (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm. 42* (1916), pp. 27, 28).—Two lots of 5 pigs each were used in an experiment comparing tankage and skim milk, ground barley and wheat middlings constituting the basal ration. The tankage at \$2.64 per hundredweight was found more economical than skim milk at 25 cts. per hundredweight. The pigs on tankage made an average gain per head of 94.2 lbs. in 95 days at a cost of 3.41 cts. per pound, while the skim milk lot gained 93.8 lbs. at a cost of 4.75 cts.

Two lots of 5 pigs each were used in a trial comparing wheat middlings, ground barley, and skim milk fed in the ordinary trough with the same rations used in self-feeders. In 95 days the first lot gained an average of 93.8 lbs. per head at a cost of 4.75 cts. per pound; while the latter gained 96.4 lbs. at a cost of 4.9 cts. The higher cost with the self-feeder was thought to be due to the greater waste, but this might be offset by the saving in labor over trough feeding.

Feeding work horses, C. W. McCAMPBELL (*Kansas Sta. Circ. 62* (1917), pp. 16).—An abridgment of Bulletin 186 (E. S. R., 29, p. 873).

The very short gestation of a mare, DE CHOIN (*Compt. Rend. Acad. Agr. France, 1* (1915), No. 25, pp. 716, 717; *abs. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 10, pp. 1472, 1473).—The author records observations on a mare which was served on March 19, 1915, and foaled on November 7, 1915, after only 233 days of pregnancy. The foal, a spring, which was perfectly viable, weighed 128 lbs. and had a height to the withers of about 36 in. The only apparent incomplete part at birth was the epidermis of the feet, which grew rapidly during the first few days of the foal's life.

The position and prospects of mountain and moorland ponies, T. F. DART (*Jour. Bath and West and South. Counties Soc., 5. ser., 14* (1916-17), pp. 112-117).—An account of steps being taken, with suggestions for future work, toward the improvement of such ponies as the fell, Highland, New Forest, Exmoor, Dartmoor, and Welsh breeds of Great Britain.

Horse breeding in the Argentine Republic at the present day, G. MARTINOLI (*Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 6 (1917), No. 6, pp. 819-825).—The 1916 census of live stock shows an increase of over 33½ per cent in horses in the Province of Buenos Aires within the last eight years. Brief notes are given of the history of horses in Argentina, the improvement of local breeds by the use of imported stallions, and the feeding and care of horses under Argentine conditions. The lack of a profitable export market for horses has led to a continual changing of ideas in breeding, and as a consequence it is difficult to obtain homogeneous lots of any importance.

Comparative studies of half-breed or "mestizo" and native chickens, B. C. VELEZ (*Philippine Agr. and Forester, 5* (1916), No. 4, pp. 103-118, figs. 2).—A comparative study was made of native chickens of the Philippines with White and Brown Leghorns and Black Orpington crosses on native stock.

For a period of 13 weeks from hatching the native chickens made an average weekly gain of 16.5 gm., while the crosses gained as follows: White Leghorn 17.72 gm., Brown Leghorn, 20.5 gm., and Black Orpington 21.66 gm.

While the number of fowls under observation were few and the results incomplete, the following conclusions are noted: The mestizo chickens were more

resistant to disease than the native. The Black Orpington cross laid more eggs than the White Leghorn cross, and the latter more than the native.

Satisfactory method of pedigreeing fowls, A. G. PHILIPS (*Rel. Poultry Jour.*, 1916, No. 12, pp. 1107, 1108, 1174, 1175, 1176, figs. 5).—An outline is given of the method used at the Indiana Experiment Station for pedigreeing chicks and recording breeding data. Samples of breeding records are illustrated.

Feeding for egg production, H. ATWOOD (*West Virginia Sta. Circ.* 27 (1917), p. 32).—This circular summarizes results of experiments by various investigators on feeding for egg production. The subjects treated include the amount of feed, the composition, combination, and digestibility of various feeds and feeding methods. The rations now used at several experiment stations and collections are given. A bibliography is appended.

Certain characteristics of hen eggs, H. ATWOOD and C. E. WEARLEY, JR. (*West Virginia Sta. Bul.* 166 (1917), pp. 3-35).—This investigation, carried on during two years with two pens of 20 each of White Leghorn pullets, sought to correlate certain differences in the eggs laid. One pen was fed corn products with beef scrap and the other wheat products and beef scrap. Tables show in detail the record of each hen and certain physical variations in the eggs.

The results showed that the heavier the egg the heavier the yolk, but its percentage to the whole egg was less. With eggs laid in cycles—that is, one each day for two days or more until a day is missed—the first egg was usually heaviest, decreasing in total weight and weight of yolk until the cycle was broken. In general the yolk had a lessened percentage decrease.

The eggs of individual hens varied widely in total weight, weight of yolk, and average percentage of yolk to total egg.

The second year the amount of beef scrap was increased, the results indicating that a considerable amount of animal protein tends to weaken the vitelline membrane. During both years the eggs and yolks of the wheat-fed fowls averaged somewhat heavier than those of the corn-fed. With the smaller amount of beef scrap in the ration the percentage of yolk was greater with the corn-fed fowls, but with the larger amount of beef scrap it was larger with the wheat-fed. During the second year the weight of eggs and yolks and the percentage of yolk were greater than the first year.

The care, sanitation, and feeding of foxes in captivity (*Canada Dept. Agr. Bul.* 29 (1916), pp. 20, figs. 4).—The great demand, especially for certain grades of foxes, has resulted in the increased production of foxes in captivity. This compilation serves to give information regarding the methods now employed by fox breeders, and to offer suggestions based partly on experience and partly on the principles involved in the breeding of similar animals.

The location of the ranch is described and plans of runs and pens given. About 2,500 sq. ft. of run should be allowed for each pair of foxes. The plant should be so constructed as to keep similar animals away on account of annoyance to the foxes and the liability of bringing in disease.

The proper feeding of foxes of different ages is detailed and an analysis of the milk of the fox given.

The fur of the silver fox is so highly prized because of its color that an effort is being made to fix this color by breeding, but as yet no definite result can be said to have been attained. It is a problem that the breeders must work out, depending upon the furriers to grade their product and to keep them in touch with the demands of fashion.

A description of parasites and diseases is given.

Rabbit and cavy culture: A complete and official standard of all rabbits and cavies, W. F. ROTH and C. T. CORNMAN (*Sellersville, Pa.: Item Publishing Co.* 1916, rev. ed., pp. 134, figs. 24).—A description of breeds and methods of breeding.

DAIRY FARMING—DAIRYING.

Influence of the age of the cow on the composition and properties of milk and milk fat. C. H. ECKLES and L. S. PALMER (*U. S. Dept. Agr., Jour. Agr. Research*, 11 (1917), No. 12, pp. 645-658, figs. 3).—This paper gives data on the question taken from records of pure-bred Jersey, Holstein, and Ayrshire cows of the dairy herd of the University of Missouri. A study is also reported of the effect of old age on the composition of milk as indicated by data secured from the records of two Jersey cows and one dairy Shorthorn cow in the university herd. The records used in the study consisted of what is termed the "true average percentage" of fat for the entire lactation period of each cow. This percentage was calculated from the total milk and fat production for the period, the milk production being based on the actual amount of milk produced at each milking for the entire period, and the fat production being based on the percentage of fat in a composite sample of five days' duration taken at the milking of each month.

It is concluded that "the percentage of fat in the milk of Jersey cows attains its maximum with respect to the average for the entire lactation period during any one of the first three periods, but the chances appear to be greater that this will be attained in the second or third period rather than the first. Holstein cows almost invariably show the highest average percentage of fat for the lactation period during the first period. Ayrshire cows more frequently show a higher average lactation test during the first than during subsequent periods, but less frequently than in the case of Holstein cows.

"The variations in the average percentage of fat among the first few lactation periods are not sufficiently great to be of much practical importance, but the gradual decline in average test accumulates to a figure of considerable importance as the number of periods of lactation becomes greater. A low plane of nutrition during growth and prior to the first lactation period probably contributes materially to a decrease in the average percentage of fat for the first lactation period from that which it would be if the period of growth was supported by a more liberal plane of nutrition.

"Neither the percentage composition of the milk nor the physical and chemical constants of the milk fat of aged cows show any abnormalities attributable to old age. Butter made from the milk of a cow 19 years old and in her thirteenth lactation period was pronounced to be of excellent quality and kept for a period of three months at a temperature of 8 to 10° C. without showing any marked deterioration."

Management of the dairy herd. R. W. CLARK (*Colo. Agr. Col. Ext. Serv. Bul. 1. ser.*, No. 127 (1917), pp. 13, figs. 7).—Notes are given on dairy barn fixtures, soiling crops, selection and feeding of dairy cows, raising dairy calves, and the age at which heifers should be bred, and rations are suggested for milch cows under Colorado conditions.

Factors and methods in the profitable production of sanitary milk. W. L. NICHOLLS (*Kentucky Sta. Bul.* 206 (1917), pp. 3-44, figs. 28).—The following articles are presented:

I. *Practical means of controlling bacterial infection of milk* (pp. 3-33).—The author discusses the bacterial and other factors in the production of sanitary milk.

II. *Experimental study of the conditions affecting the contamination of milk* (pp. 34-43).—This part of the bulletin describes experiments carried on with a view to determining the number of bacteria to which milk is subjected during the various daily operations in the dairy barn and milk room and to determine the best means of preventing bacterial contamination. The results were as follows:

made by exposing glass petri dishes containing a sterile nutrient medium in the dairy barn of the station and the adjoining milk room.

The results indicate that in a well-cleaned dairy barn very few bacteria are present in the air, but when dust is present the number is very large. "When the cows are in the barn the number of bacteria in the air is materially increased. The presence of bedding in the stable greatly increases the bacteria in the stable air. Dusty mill feeds and hay are fruitful sources of bacterial contamination. The act of brushing the cows adds myriads of bacteria to the surrounding atmosphere. Washing the cows' udders, even when apparently clean greatly reduces the number of bacteria falling from the udder. Infection from washed udders is less than one-seventh of that from unwashed udders. The air in a pasture upon which is growing a heavy sod of grass is nearly sterile. In a dairy room having smooth walls and a concrete floor which are regularly and carefully washed the air should be practically free from bacteria."

It is suggested that "to keep down the bacterial contamination of the air in the stable where the cows are milked the room must be kept well cleaned and every effort must be made to keep down all dust. Dusty bedding must be matted, and if bedding is used dust should be laid by sprinkling. Since cow udders are laden with bacteria, all loose hairs should be removed from the cows by currying, in order to prevent them from falling into the milk. However, sufficient time should elapse after currying to permit the dust and bacteria to settle to the floor before milking begins. The cows' udders should be carefully washed with tepid water and a clean cloth before milking begins. Wiping the udder with a clean, damp cloth greatly reduces bacterial contamination of the milk. In feeding mill feeds and hay care should be taken to raise as little dust as possible."

A preliminary report on a series of cooperative bacterial analyses of milk, R. S. BREED, W. A. STOCKING, ET AL. (*Jour. Dairy Sci.*, 1 (1917), No. 1, pp. 19-22). In this paper, which was read before the Laboratory Section of the American Public Health Association, at Cincinnati, October 24, 1916, a preliminary report is submitted of bacteriological analyses of milk made to determine whether the results secured in laboratories by university men trained in such methods were as irregular as those secured in the commercial and control laboratories in New York City. Bacterial analyses were made of four lots of five samples each by seven men, four working in the Cornell University laboratory at Ithaca, and three at the New York State Experiment Station. Each man used the technique he thought would give accurate results. The results are compared with those secured in New York City and already reported (*E. S. R.*, 33, p. 767).

A second series of analyses was made on samples of three lots of high-grade milk inoculated with a culture of the colon bacillus, for the purpose of comparing results secured by the plate method, by the dilution method, and group and individual counts by the microscopic method. These counts were made by one person only.

It is concluded that "research men using technique which differs much in details may be depended upon to secure much more consistent agar plate counts than ordinary samples of market milk than laboratory assistants working haphazardly and using the routine methods of analysis recommended for the purpose. Inexperienced workers are apt to make gross errors in count when using the direct microscopic method as a means of making exact counts. Experienced workers, however, secure results which compare favorably with those secured by workers who have had experience with the plating technique. The labor and time necessary in order to make relatively accurate counts by

either method is much greater than that ordinarily employed in making counts in laboratories where large numbers of routine analyses are made.

"In making comparative counts with the plate and microscopic methods, the agar plate counts will normally be larger than the counts of groups of bacteria by the microscopic method and smaller than the count of individual bacteria but many things may change this relationship in individual cases. Among these things are inaccuracies in the counts due to exceptionally irregular distribution, the presence of dead bacteria, or of living bacteria incapable of growth on the agar used. Where a milk contains nothing but living bacteria occurring singly (or at least with only a relatively small number of groups containing two or more individuals), all of which are capable of growth on the agar used, very consistent counts can be made by either method from duplicate samples by the same or by different persons. In such cases the relation between the counts is such as to leave little doubt but that the figures obtained are remarkably accurate counts of the number of groups of bacteria. In the case of both the microscopic and plate methods; or of the number of bacteria present in the case of the microscopic method."

Buttermaking on the farm, G. H. BARR (*Canada Dept. Agr., Dairy and Cold Storage Branch Bul. 53 (1917), pp. 16, figs. 11*).—Brief directions are given for making butter on the farm.

Home cheese making, V. E. SCOTT (*Agr. Ext. Univ. Nev. Bul. 15 (1917), p. 8, figs. 5*).—Simple directions are given for the home manufacture of a number of common cheeses.

VETERINARY MEDICINE.

Public health and medicine, W. C. GORGAS (*Proc. 2. Pan Amer. Sci. Cong. 1915-16, vols. 9, pp. XV+714, pls. 2, figs. 35; 10, pp. XV+652, pls. 7, figs. 24*).—Among the papers here presented relating to diseases and the transmission of disease by insects mention may be made of the following: In volume 9, *Insect Borne Diseases in Pan America*, by J. Guiteras (pp. 9-41) (E. S. R., 34, p. 74); *Filariasis in the Americas*, by A. J. Smith (pp. 49-76); *Present Views in Respect to Modes and Periods of Infection in Tuberculosis*, by M. P. Ravenel (pp. 85-95) (E. S. R., 35, p. 281); *Carlos Finlay on the House Mosquitos of Havana*, by F. Knab (pp. 107-110); and in volume 10, *Concerning the Chemical Nature of the Vitamins*, by R. R. Williams (pp. 39-48); *Specific Parenteral Digestion and Its Relation to the Phenomena of Immunity and Anaphylaxis*, by J. Brofenbrenner (pp. 278-287); *The Mechanism and Clinical Significance of Anaphylactic and Pseudoanaphylactic Skin Reactions*, by J. A. Kolmer (pp. 287-304); *Anaphylatoxin and the Mechanism of Anaphylaxis*, by R. Weil (pp. 308-315); *General Problems and Tendencies in Cancer Research*, by L. Loeb (pp. 347-354); *Factors in Immunity to Cancer*, by J. B. Murphy and J. J. Morton (pp. 360-362); *Immunity to Transplantable Neoplasms*, by W. H. Woglom (pp. 362-365); *Tumor Immunity*, by E. E. Tyzzer (pp. 365-382); *General Biology of the Protozoan Life Cycle*, by G. N. Calkins (pp. 529-536); *Parasitology of Certain Animals of Paraguay*, by L. E. Migone (pp. 573-576); *On the Inhibitory Properties of Magnesium Sulphate and Their Therapeutic Application in Tetanus*, by S. J. Meltzer (pp. 607-615) (E. S. R., 35, p. 75); *Observations on Tropical Parasites*, by R. González-Rincones (pp. 615-618); and *Antirabic Vaccination in Havana with Statistics Compared with Those of Other Nations*, by J. Santos Fernández (pp. 635-637).

Practical veterinary pharmacology and therapeutics, H. J. MILKS (*New York: The Macmillan Co., 1917, pp. [10]+519, pls. 3, figs. 19*).—This work is

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served for a practical text on veterinary materia medica, pharmacology, and therapeutics.

Report of the veterinary director general for the year ended March 31, 1916. F. TORRANCE (*Rpt. Vet. Dir. Gen. Canada, 1916, pp. 36, fig. 1*).—In addition to a report of the work of the year with the more important diseases of the stock and import testing, a report is given (pp. 16-18) on the phenol coefficient of disinfectants tested by the Hygienic Laboratory method, under the direction of C. H. Higgins. A detailed account of the work of the meat and canned foods division is also included.

The phenol coefficients of samples of disinfectants tested are as follows: Chlorid of lime, 11.8 and 13.3; Cooper's fluid, from 1.53 to 2.7; cresol compound, from 0.12 to 2.98; crude carbolic acid, from 0.34 to 5.56; crude carbolic acid (an emulsified product), from 0.12 to 2.63; Cooks Cofectant, 10; cresolin, from 2.2 to 4.6; formaldehyde, 0.2; hycol, 4.31; Izal, 4.18 to 8.6; Izal, veterinary, 2.62; J. A. G., 1.4; K. K. disinfecting fluid, from 0.8 to 2.8; lime, from 3.2 to 17.6; Lysol, 15.2 and 16.9; Pheneco, 15.8; pyxol, from 10.6 to 13; sand disinfectant, 0.63; sodium hypochlorite, 5; Wescol, 4.3; and zenoleum, 2.3.

[Diseases of animals in Saskatchewan], P. F. BREDT (*Ann. Rpt. Dept. Agr. Saskatchewan, 11 (1916), pp. 87-97*).—This reports on the occurrence of infectious and parasitic diseases of animals in Saskatchewan and incorporates a report by the provincial veterinarian, M. P. McClellan.

Wyoming live stock laws and regulations of the State veterinarian, 1917. W. W. FRENCH (*Cheyenne, Wyo.: State, 1917, pp. 58*).—A compilation of the Wyoming laws.

The distribution in wheat, rice, and maize grains of the substance, the deficiency of which in a diet causes polyneuritis in birds and beriberi in man. HARRIETTE CHICK and E. MARGARET HUME (*Proc. Roy. Soc. [London], Ser. B, 90 (1917), No. B 624, pp. 44-60*).—This is a report of experiments which deal with the distribution of "antineuritic" vitamins in the various constituents of wheat, maize, and rye grains.

"Wheat endosperm, after removal of the aleurone layer in the ordinary milling processes, constitutes white flour. It is deficient in this vitamin, and if used as an exclusive diet will induce polyneuritis in pigeons (or beriberi in man) in a manner identical with polished rice. In both the rice and wheat grain the antineuritic vitamin is concentrated mainly in the germ or embryo; it is also present to a less degree in the bran (pericarp and aleurone layer), probably in the aleurone layer.

"In the case of maize grain the embryo also possesses marked antineuritic properties. Here the scutellum can be separated from the 'plantlet' and separately investigated. Both these constituents of the embryo were found to contain antineuritic vitamin."

Researches on the diagnosis of pregnancy in cows, mares, and goats by the Abderhalden method. R. GIULIANI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 40 (1917), No. 17-18, pp. 494-528*).—Previous literature on the subject of the pregnancy test as applied to domestic animals is reviewed, and investigations reported on the value of the test, particularly in connection with artificial fertilization as described by Pirocchi (*E. S. R., 33, p. 71*). The dialyzation method was carefully followed according to the Abderhalden technique. From the results of the experiments recorded the author draws the following conclusions:

(1) The methods can be relied upon in the majority of cases provided that the technique of Abderhalden (*E. S. R., 32, p. 270*) be followed scrupulously, that control tests be made with serum alone and with inactive serum and

placenta, and that in doubtful cases a second and third test be made. (2) The specific proteolytic ferments can be detected in the blood from the sixteenth to the nineteenth day after conception; that is, a diagnosis of pregnancy can be made about the end of the third week. (3) The ferments seem to remain in the blood for a period of 15 to 20 days after parturition, a fact which must be taken into consideration to avoid errors in the application of the method.

The catalase content of *Ascaris suum*, with a suggestion as to its rôle in protecting parasites against the digestive enzymes of their hosts, T. E. MAGATH (*Jour. Biol. Chem.*, 53 (1918), No. 3, pp. 395-400, fig. 1).—The amount and distribution of catalase in the body of the common *Ascaris*, a roundworm from the hog, were determined with a view to testing the validity of the theory advanced by Burge (*E. S. R.*, 33, p. 478) that the presence of oxidative processes in the intestinal parasites protects them from digestion. The method used was one adapted from ordinary gas analysis. The material was washed with a 75 per cent sodium chlorid solution and finely chopped up, weighed in a crucible, and introduced into a bottle containing 25 cc. of one-half dilute commercial hydrogen peroxid. This was connected with a water-filled burette with a leveling bulb. After bringing the water to the zero level, connection was made with the bottle containing the hydrogen peroxid, the action started by upsetting the crucible in the hydrogen peroxid, and after 10 minutes the water in the leveling bulb brought to the level of the water in the burette and the reading made.

Determinations were made of the catalase content of the whole worm, the body wall, body fluid, and visceral organs with the following results: "There is five-eighths as much catalase in the body wall of *A. suum* as in the visceral organs, and one-fourth as much in the body fluid as in the visceral organs. There is three times more catalase in the body wall of *A. suum* than in the muscles of *Rana pipiens*, if one uses the amount of the catalase in the reproductive organs of each form as the units of measurement. On the basis of the last statement it can be assumed that there is more than enough catalase in the body wall of this parasitic worm for its metabolic and locomotory functions, and hence it is possible that this excess is used to liberate oxygen for protecting the parasite against the digestive enzymes of its host, if Burge's theory be true."

Researches on the serum of the sea eel, W. KOPACZEWSKI (*Compt. Rend. Acad. Sci. [Paris]*, 164 (1917), No. 25, pp. 963, 964; 165 (1917), Nos. 18, pp. 600-602; 21, pp. 725-727).—Three papers are presented.

I. *The toxicity of the serum.*—The serum of the sea eel was shown to be exceedingly toxic when injected intravenously into guinea pigs, rabbits, and dogs. The rapidity of the intoxication and the picture on autopsy resemble to a certain extent, anaphylactic shock.

II. *The toxicity and physical properties of the serum.*—Studies of the effect of the various factors on the toxicity of the serum showed that the toxicity is not destroyed by keeping the serum in the dark even for as long a period as 30 days, by freezing, by absorption in animal charcoal or kaolin, and by drying, but is destroyed by sunlight and by heating to 75° C.

III. *Molecular equilibrium and toxicity of the serum.*—In connection with the study of the effect of physical agents on the toxicity of the serum, noted above, the serum was examined under the ultramicroscope. It was found that wherever the serum is inactivated profound changes take place in its ultramicroscopic structure. The particles previously separated and in an active Brownian movement arrange themselves in groups and become stationary. When the serum is mixed with that of an experimental animal an ultramicroscopic precipitation takes place. By modifying the surface tension of the serum

by the addition of cholesterol or sodium oleate the appearance of the agglomerations can be hastened or retarded, and simultaneously the disappearance of specificity of the serum hastened or retarded.

Experiments in the differentiation of blood and muscular albumin by precipitation and anaphylaxis. C. LOPEX (*Amer. Jour. Vet. Med.*, 12 (1917), pp. 853-857).—The processes at present employed for obtaining serums for the differentiation of the albumin of blood serums are reviewed, and the following conclusions are drawn from the author's investigations of possible methods:

(1) To obtain precipitating serums for blood albumin, the best method is that of intravenous injections of 20 cc. each of horse serum into rabbits weighing at least 3 kg. (2) For the differentiation of albumin of the muscles, the easiest and most easily obtained and preserved antigen is that obtained by adding albumin chloride to minced meat and dialyzing the juice through parchment paper.

When a greatly accentuated degree of specificity is required, as in dealing with meats denaturalized by heat, the author has found anaphylaxis reactions superior to precipitins for the differentiation of albumin.

A new enzyme of the leucocytes of blood and of pus, lipoidase. N. FIESCHER and R. CLOGNE (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 21, pp. 219-222; *abs. in Chem. Abs.*, 12 (1918), No. 7, p. 705).—The authors have demonstrated that the leucocytes of the blood and acute suppurations have the power of secreting an enzyme (lipoidase) which hydrolyzes lecithin. The enzyme is destroyed by heating to from 56 to 60° C. for 30 minutes. It does not act in strongly acid or alkaline solutions but preferably in a slightly alkaline medium. Its action is inhibited by formalin, by red corpuscles in large quantities, and probably by normal serum. The enzyme has been identified in normal leucocytes of the blood of man, the dog, and the cat, and in aseptic and septic abscesses. It is present in polynuclear cells and absent in the lymphocytes of certain chronic effusions, as in pleurisy. This lipoidase can be distinguished from the leucocytic lipase by its greater thermostability.

Studies of the blood fat and lipoids of the dog before and after the production of experimental anemia. H. DUBIN (*Jour. Biol. Chem.*, 33 (1918), No. 1, p. 377).—By the use of the nephelometric and colorimetric methods of Bloor (*E. S. R.*, 34, p. 563; 35 pp. 13, 166), blood fats have been estimated in a dog before and after infection with *Trypanosoma equiperdum*. The results show that in trypanosome anemia the total fats are increased while the lecithin and cholesterol are decreased. These results are in agreement with the reports of Bloor (*E. S. R.*, 36, p. 365) in pernicious anemia associated with carcinoma of the stomach.

Immunity and tissue transplantation.—I, The reactions occurring about tissue transplanted into heterologous animals. M. S. FLEISHER (*Jour. Med. Research*, 37 (1918), No. 3, pp. 483-497).—The experiments reported were carried out in normal and immune rabbits into which pieces of guinea-pig kidney were transplanted. The rabbits were immunized by repeated intraperitoneal injections of sterile emulsions of kidney cells. In both the normal and immunized rabbits pieces of guinea-pig kidney removed from the living animal were immediately transplanted under aseptic precautions into subcutaneous pockets on the abdomen of the rabbit. The pieces were removed and examined at various intervals up to 28 days. The examination showed the following marked differences between the pieces in normal and in immunized animals:—Kidney of guinea pigs transplanted into normal rabbits remains alive and shows regeneration even at 28 days. No regeneration takes place in immune animals. Leucocytes collect in larger numbers about the transplanted tissues

in immune animals than in normal animals. The leucocytes do not, however, penetrate the tissue as rapidly in the immune animals. The connective tissue formation in normal rabbits is more rapid and more marked than in immune animals. The penetration of the pieces in normal animals by connective tissue cells is also more rapid."

The significance of the difference between the reactions in normal and immune animals has not yet been determined.

Is there any quantitative relationship between antigen dose and antibody production? E. T. H. TSEN (*Jour. Med. Research*, 57 (1918), No. 3, pp. 381-394, figs. 2).—The question was investigated by intravenous injections of different doses of sheep serum into rabbits and subcutaneous injections of different doses of antityphoid vaccine into medical students. Examination was made of the precipitin and agglutinin productions, respectively.

The results seem to show that there is no quantitative relationship between the antigen dose and antibody production. As much antibody can be produced in response to the injection of small as to that of large doses of antigen. Moreover, large doses of antigen are at times harmful through injury to the cells, so that the animal either dies of intoxication or remains in a state of lowered resistance with the production of little or no antibody.

A comparison of the slow and rapid methods of antibody production confirmed the results of Gay and Fitzgerald, previously noted (E. S. R., 20, p. 581), that the rapid method is as efficient as the slow method.

An experimental investigation of lipovaccines.—A preliminary note. E. R. WHITMORE, E. A. FENNEL, and W. F. PETERSEN (*Jour. Amer. Med. Assoc.*, 7 (1918), No. 7, pp. 427-431, fig. 1).—The preparation and methods of preservation and administration of lipovaccines from typhoid, paratyphoid, pneumococcus meningococcus, and dysentery organisms are described with experimental data. Although considering the work as purely preliminary, the authors feel that the lipovaccine offers a number of advantages over the aqueous preparation, including "the diminution of both the local and the systemic reaction, the feasibility of giving sufficient vaccine at a single injection properly to immunize the individual, the persistence in the individual of a focus from which the immunization proceeds over a period of several months with a resulting lengthening of the period of immunity, the actual detoxicating effects of certain lipids that can be incorporated in the vaccine, and the prevention of autolysis and deterioration of the vaccine."

The effect of high pressures on bacteria, W. P. LARSON, T. B. HARTZELL, and H. S. DIEHL (*Jour. Infect. Diseases*, 22 (1918), No. 3, pp. 271-279).—This article reports the results of attempts to obtain the antigenic principle of bacteria in a diffused state in order to make it less accessible to the phagocytes and consequently capable of producing a higher degree of immunity than is ordinarily possible with bacterial antigens.

It was found that a direct pressure of 6,000 atmospheres kills nonspore-forming bacteria in 14 hours. A pressure of 12,000 atmospheres for the same length of time is required to kill spores. Attempts to discover the mechanism of the destruction of bacteria in this way resulted in the conclusion that the factor which destroyed the organisms was the sudden change in the osmotic tension of the fluid in which the bacteria were suspended.

Filtrate of typhoid bacteria subjected to a direct load of 6,000 atmospheres for 14 hours was found to be superior to the living culture as an immunizing antigen. Bacteria killed by carbon dioxide were found to be excellent antigens.

Identity of the toxins of different strains of *Bacillus welchii* and factors influencing their production in vitro, C. G. BULL and IDA W. PARSONS

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Jour. Expt. Med., 26 (1917), No. 6, pp. 867-883, figs. 10; *abs. in Chem. Abs.*, 12 (1918), No. 1, p. 51).—Continuing previous studies (E. S. R., 38, p. 379) by investigating 22 additional strains of *B. tetelchii* for toxin production and antitoxin treatment, the authors have found that "the antitoxin for *B. tetelchii* toxin can apparently be prepared from a single strain of the organism which yields under the conditions described a high titer of toxin, and this antitoxin can be employed to combat infection with or prevent infection by any strain whatever of the bacillus."

Experiments to determine the effect of fresh muscle and glucose on toxin production and the relation of acidity to toxicity in the filtrates have shown that (1) fresh muscle increases the potency of the toxin fivefold while autolyzed muscle has little effect; (2) the addition of 0.2 to 1 per cent glucose to beef infusion broth gives a more potent product than sugar-free broth, and higher percentages lower the toxin production; and (3) there is no direct relation between acidity and toxicity.

Bacterium pyogenes and its relation to suppurative lesions in animals, R. WARD (*Jour. Bact.*, 2 (1917), No. 6, pp. 619-628).—Substantially noted from another source (E. S. R., 37, p. 276).

The use of commercial Javelle water in the treatment of infected wounds, BEN and MISS S. KRONGOLD (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 2, pp. 569-572).—From the results of 510 cases of wounds treated with a solution of Javelle water (15 parts to 1,000) and from the action on fragments of skin of this solution as compared with the Dakin-Daufresne hypochlorite solution, the authors state that at the above concentration, containing 0.427 gm. of hypochlorite per liter, the Javelle water is more germicidal and less irritating than Dakin's solution.

On the treatment of war wounds by the combined action of visible and ultra-violet radiations, C. BENOIT and A. HELBRONNER (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 17, pp. 572-574).—Experiments extending over two years on the use of the Cooper-Hewitt mercury lamp for treating war wounds are reported. These include the treatment of atonic and ulcerated wounds, recent wounds over a larger surface, and closed and open fractures.

A new method of general chemotherapy-oxidotherapy, BELIN (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 26, pp. 1074-1076; *abs. in Chem. Abs.*, 12 (1918), No. 7, pp. 722, 723).—Clinical cases are cited in which injections of potassium permanganate of different strengths have been successfully used in the treatment of tetanus, typhoid fever, etc. Earlier experimental work¹ has demonstrated the favorable effect on certain infectious maladies of the action of oxidizing substances.

The theory advanced by the author is that by oxidation the toxins are rendered inactive, thereby permitting the organism to combat more successfully with the microorganisms themselves. "Antitoxic therapy based on oxidation, therefore, would seem to be as indispensable as antimicrobial therapy in producing phagocytosis." As possible therapeutic agents, the author cites potassium permanganate, sodium chlorate, sodium persulphate, ozone, colloidal bromine, and pinene.

The restraining influence of cyanid upon oxidation in arsenical dips, A. G. BURGESS (*Rhodesia Agr. Jour.*, 14 (1917), No. 6, pp. 733-737).—The article reports the results of investigations into the cause of the oxidation of sodium

¹ *Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), Nos. 16, pp. 1260-1262; 24 pp. 1848, 1849, 1850 (1914), No. 13, pp. 966-968; *Bul. Soc. Cent. Méd. Vét.*, 92 (1916), No. 14, pp. 293-296; 93 (1917), No. 12, pp. 244-248.

arsenite in dipping fluids used for tick killing. The arsenate thus formed has only about one-half the tick-killing power of the arsenite.

To determine whether the oxidation is the result of microorganisms, studies on dipping fluids of various strong disinfectants was tested. Oxidation was not completely arrested by 2.5 per cent formalin, 5 per cent corrosive sublimate, 0.5 per cent carbolic acid, and 2 per cent boric acid, which would seem to prove that the oxidation is not wholly due to microorganisms. Sterilizing in an autoclave, boiling for half an hour, and passing the original dipping fluid through a candle filter also failed to arrest oxidation completely. Small amounts of potassium cyanid proved most effective. The retarding influence of oxidation remained constant until 0.005 per cent was reached; below this, oxidation increased as the amount of cyanid was decreased.

Further investigations are to be reported later.

The relationship between contagious pustular stomatitis of the horse, equine variola (horsepox of Jenner) and vaccinia (cowpox of Jenner), D. A. DE JONG (*Folia Microbiol. [Delft]*, 4 (1916), No. 3, pp. 239-266, pls. 5; *Comp. Path. and Ther.*, 30 (1917), No. 3, pp. 242-262, figs. 5; *abs. in Trop. Vet. Bul.*, 5 (1917), No. 3, pp. 200-202).—The equine affections described under the above names are first critically reviewed and reference made to outbreaks in various countries. A detailed description of the symptoms manifested in outbreaks of pustular stomatitis at garrisons near The Hague follows.

Numerous experiments in the transmission of contagious pustular stomatitis of horses to healthy horses and also to calves, rabbits, etc., are reported upon. The conclusions are as follows: "In the observed cases of contagious pustular stomatitis of the horse there was an eruption in the mouth and on the skin. In the experiments material collected from the mouths of the animals appeared proved capable of transmitting the disease, including cutaneous eruptions. This material, after it had been passed through Chamberland B and F filters, still possessed the same infective quality. The ordinary vaccine, propagated in the usual manner, was equally capable of giving the horse pustular stomatitis including cutaneous eruptions. The horse which had contracted the stomatitis spontaneously was refractory to inoculation with vaccine. Two different strains of the virus of contagious pustular stomatitis of the horse behaved like vaccines when inoculated to the calf and to the rabbit, and in the latter Guarnieri's corpuscles were present in the inoculated cornea. Besides, the complement test furnished corroborative evidence in support of this view.

"The vaccine obtained by inoculating with the virus of contagious pustular stomatitis of the horse could be propagated in animals with the same regularity as the ordinary vaccine. This vaccine derived from the horse gave excellent vaccinal pustules when inoculated into children. The revaccinated subjects presented only a reaction of revaccination. The rabbits which had been inoculated with ordinary vaccine and had shown a markedly positive reaction after recovery and revaccination with the virus of stomatitis showed only a pronounced allergic (von Pirquet) reaction, whereas the control animals showed a characteristic reaction.

"We have proved that contagious pustular stomatitis of the horse is actually the most frequent form of Jenner's horsepox, and that the virus of this stomatitis passes through Chamberland B and F filters. This fact was not previously known."

Anthrax. A case of *Bacillus anthracis* septicemia with recovery. R. R. GRAHAM and H. K. DETWEILER (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 16, pp. 671, 672, figs. 2).—The authors report the successful treatment of a case of anthrax in man in which the organisms were demonstrable in the circulation in the blood despite local excision and subcutaneous injection of serum. Intravenous

ation of 100 cc. of chloramin-T (Dakin) and 80 cc. of antianthrax serum, followed by a rapid lowering of pulse and temperature with eventual recovery.

Studies in blackleg immunization with special reference to blackleg fillet. A. EICHHORN (*Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 6, pp. 653-654).

This has been essentially noted from another source (E. S. R., 37, p. 35). Attention is called to the resemblance between the bacillus of blackleg and *B. welchii* morphologically, biologically, and in cultural characteristics.

Epizootic lymphangitis; some treatments. FRANS (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 24, pp. 527-533, fig. 1).—The following treatments are discussed: (1) local—cauterization, and Vincent's powder (boric acid and calcium hydroxide); (2) general—arsenic acid, Lugol's solution of iodine and potassium iodide, sodium cacodylate, mercuric biniodide, and mercuric benzoate; and (3) pyrotherapy.

Treatment of epizootic lymphangitis by means of the extract of autolyzed yeast. M. NOLLE, FAYET, and TRUCHE (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 27, pp. 1114, 1115).—An application of antigen therapy in the treatment of epizootic lymphangitis in horses is described. The agent employed is a liquid extract of brewers' yeast autolyzed for 24 hours at 37° C. in the presence of chloroform. To this is added 5 per cent of phenol. Successful results obtained by the authors in the treatment of six horses are reported.

The proposed technique is to make a preliminary subcutaneous injection of 5 cc. of the liquid, followed after from four to eight days by 5 cc. and eight days later by 10 cc. The latter dose may be repeated once or twice if necessary. The name "rivoltine" is suggested for the preparation.

Treatment of epizootic and ulcerous lymphangitis by autopyotherapy. VÉLU (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 18, pp. 346-362).—The author describes two methods of preparing pyovaccine from the pus of the diseased animal and discusses the general manifestations of the vaccination from observations of 15 cases, and interprets the results obtained.

The pus obtained from a ripe abscess is sterilized by ether or by heating at 60° C. for an hour in six or seven volumes of boiled water. The ether sterilization is preferred by the author.

After vaccination the animal passes through a negative phase of hyperesthesia marked by an increase in the acuteness of the symptoms. This is followed by a positive phase characterized by a diminution of the symptoms and general recovery. Lymphangitis can be cured by autopyotherapy alone, while treatment does not preclude the use of chemotherapy. The importance is emphasized of using small doses of the vaccine at first and of using pus from the animal itself, that is autopyotherapy and not simply pyotherapy.

A complementary note relative to the preparation of the pyovaccine employed in the treatment of epizootic and ulcerous lymphangitis, BELIN (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 22, pp. 462-465).—Additional directions are given for the preparation of pyovaccine by sterilization with ether.

Pyrotherapy of epizootic lymphangitis. VÉLU (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 22, pp. 452-456).—This article gives detailed instruction relative to the treatment of epizootic lymphangitis by pyrotherapy.

The preparation of pyovaccine for epizootic lymphangitis. H. VÉLU (*Bul. Path. Exot.*, 11 (1918), No. 1, pp. 10, 11).—The author distinguishes between the "polyvalent" pyovaccine obtained from open lesions in epizootic lymphangitis, and capable of acting on the cryptococci and associated organisms, and the polyethnical anti-cryptococcic vaccine prepared from products of new lesions or closed abscesses of different animals having epizootic lymphangitis. The latter vaccine contains only the cryptococcus from various sources.

The technique of the preparation of the polyvalent antipyogenic vaccine is described in detail. This can be used not only in the treatment of epizootic lymphangitis but also in that of various pyogenic lesions in the horse.

Some typical cases of treatment of epizootic lymphangitis by pyotherapy VELU (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 24, pp. 511-524).—Several cases are described.

Leucocytotherapy or aseptic pyotherapy, its use in certain lymphangitis of the horse, J. BRAINÉ (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 1, pp. 1121-1123; *abs. in Rev. Gén. Méd. Vét.*, 27 (1918), No. 313, pp. 20-21; *Chem. Abs.*, 12 (1918), No. 6, p. 593).—The nonspecificity of cryptococcal pyovaccine and the efficacy in ulcerous lymphangitis of a pyovaccine very poor in microorganisms suggested to the author that the vaccines owed their efficacy not to the specific microbes which they contained but to leucocytes or leucocyte débris and the products derived from them, and that, consequently, the same satisfactory results will be obtained by the injection of an aseptic pus such as is found in a fixation abscess. To test this theory, horses with epizootic and ulcerous lymphangitis were injected with a dilution of pus obtained from a fixation abscess previously produced by subcutaneous injection of essence of turpentine. The liquid was quickly absorbed and generally no trace of the injection was left.

The second treatment was in all cases followed by a very rapid cure, thus confirming the author's theory. "Aseptic pyotherapy can be employed advantageously in equine lymphangitis and in diseases where pyovaccines have already been satisfactory. It is possible that it is susceptible of a more general application."

Some considerations on the efficacy and absolute nonspecificity of ant-cryptococcal pyotherapy in the horse, H. VELU (*Bul. Soc. Path. Exot.*, 12 (1918), No. 1, pp. 12-17).—Cases are cited from which the conclusion is drawn that polyvalent nonspecific pyotherapy is a simple economical method and that by the results already obtained should occupy a position of the first order in therapeutic veterinary practice.

The necessity of carbon dioxide for the growth of *Bacillus tuberculosis* W. B. WHERRY and D. M. ERVIN (*Jour. Infect. Diseases*, 22 (1918), Vol. 1, pp. 194-197, fig. 1).—Tests on culture media showing the effect of different carbon dioxide pressures on the growth of *B. tuberculosis* are reported. The necessity of carbon dioxide and of a supply of free oxygen for growth of the organism in artificial media is shown. The optimum requirements have not yet been determined.

An investigation of strains of tubercle bacilli from animal tuberculosis A. S. GRIFFITH (*Jour. Path. and Bact.*, 21 (1917), No. 3, pp. 329-343).—The investigations here reported relate to the types of tubercle bacilli from naturally acquired tuberculosis in the monkey, cat, goat, bovine, and bird; the cultural characteristics of bovine tubercle bacilli; and human tubercle bacilli in the milk of a vaccinated heifer.

Infectious abortion in cows, K. BÜCHLI (*Meded. Rijksseruminat. Inst.*, 1917, No. 3-4, pp. 121-205, figs. 2).—The author has reviewed the literature on this disease including the history, etiology, biology, and course of the disease; symptoms and diagnosis; abortion and its application; agglutination and complement fixation; active and passive immunity; methods of combating the disease; and veterinary laws for controlling it. A bibliography of 68 titles is appended.

Mixed bacterial diseases of swine with differential diagnosis, J. P. RADFORD (*Amer. Jour. Vet. Med.*, 13 (1918), No. 2, pp. 57-61).—The author discusses

under the term "mixed infections of swine" various pulmonary diseases such as chronic bronchitis, pulmonary edema, and catarrhal pneumonia, and also diseases classified as necrobacillosis caused by *Bacillus necrophorus* and its associate organisms. He asserts that chronic hog cholera does not exist, but that the lowered resistance of the animal after an attack of cholera makes possible invasion by the organisms of the mixed infection group.

The serum treatment of hog cholera, R. GRAHAM (*Illinois Sta. Circ.* 207, 1917, pp. 3-11, figs. 3).—This is a popular summary of information.

Ergopyrismus (buckwheat poisoning) and similar affections, E. A. BRUCE (*Amer. Vet. Med. Assoc.*, 52 (1917), No. 2, pp. 189-194).—An outbreak of ergopyrismus poisoning in pigs at the University of British Columbia first recorded, followed by accounts of similar conditions produced by alfalfa, clover, St. John's wort, and knotweed. The toxic properties claimed for the knotweeds (*Pteris aquilina* spp.) have not been substantiated by experiments made at Agassiz.

The poisoning of horses by the common bracken (*Pteris aquilina*), S. J. HARRIS and E. A. BRUCE (*Canada Dept. Agr., Health Anim. Branch Bul.* 26, 1917, pp. 15, figs. 5).—This is a report of investigations and experiments on ergopyrismus poisoning in British Columbia of which a summary has been previously published from another source (*E. S. R.*, 37, p. 182).

Further experiments with five horses reported indicate that the addition to ordinary diet of about 6 lbs. of dried bracken will kill a horse in about one month.

RURAL ENGINEERING.

Operation and maintenance of irrigation systems, S. T. HARDING (*New York McGraw-Hill Book Co., Inc.*, 1917, pp. XII+271, pls. 12, figs. 28).—The scope of this volume is apparently to cover the practical principles of the operation and maintenance of irrigation systems and to illustrate them by practical examples of their local application. No attempt is made to cover practice outside of the United States.

The opening chapters deal with general maintenance, including damages for failure to maintain and maintenance of canals, and maintenance of structures for serviceable life of irrigation structures. Other chapters deal with organization for operation and maintenance, methods of delivering irrigation water, measurement of irrigation water, irrigation rules and regulations, payment for construction and operation charges, general operation, and operation and maintenance accounts. An appendix gives rules and regulations for several irrigation districts and water companies.

Irrigating flume built with the cement gun (*Engin. News-Rec.*, 79 (1917), p. 12, pp. 449-451, figs. 4).—This is a brief description of the construction of a supporting flume with 2-in. reinforced walls built upon inside forms.

It was found that 130 linear feet could be constructed per 8-hour shift. The cement gun was found to operate most economically when within 50 ft. of point of application. The mixture used consisted of one part cement plus one part hydrated lime and 4.5 parts of coarse sand. In shooting the walls it was found that the rebound material amounted to about 10 per cent of the material adhering to the forms.

Pumping plants of the U. S. Reclamation Service, S. T. HARDING (*Jour. Irrig. Div.* 39 (1917), No. 3, pp. 108-110, figs. 4).—This article gives data on comparative costs of raising 1 acre-ft. of water through a height of 1 ft.,

compiled from the records of the U. S. Reclamation Service. Records for 1915-16 service are given in the following table:

Operation records of irrigation pumping plants of the U. S. Reclamation Service for 1915-16.

Plant.	Type of plant.	Capacity of prime movers.	Head pumped against.	Kilo-watt hours used per foot-acre-foot.	Seasonal plant efficiency.	Cost of operation per foot-acre-foot.	Interest on first cost per foot-acre-foot.	Total cost per foot-acre-foot.
Salt River Project:		<i>Horse-power.</i>	<i>Feet.</i>		<i>Per cent.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>
Battery A.....	Vertical motor-driven centrifugal pumps.....	75	49.0	1.85	55.5	3.9	1.2	5.1
B.....		75	46.2	1.70	60.2	2.6	1.2	3.8
C.....		75	48.4	1.59	64.5	2.1	1.2	3.3
D.....		75	46.5	1.50	68.3	2.1	1.2	3.3
E.....		75	44.5	1.65	62.1	2.6	1.2	3.8
F.....		75	32.0	2.28	45.0	3.7	2.1	5.8
McQueen well.....	Horizontal motor-driven centrifugal pumps.....	75	40.0	2.25	45.6	2.2	1.4	3.6
Clemens.....		100	31.3	2.56	40.1	3.1	1.4	4.5
San Francisco.....		100	30.0	2.60	39.5	11.9	11.5	23.4
High line.....		450	43.0	1.40	73.2	1.3	2.1	3.4
Minidoka Project:								
First lift.....	Vertical motor-driven centrifugal pumps.....	2,700	29.1	1.58	65.0	.....	.....	.....
Second lift.....		2,400	30.3	1.73	59.3	.....	.....	.....
Third lift.....		1,560	29.9	.....	.....	.....	.....	.....
West End.....	Horizontal motor-driven centrifugal.....	150	20.8	2.42	42.4	1.4	.....	.....
1812 Station.....		5	3.8	3.90	26.3	11.0	6.3	17.3
A 4 Station.....	Scoop wheel.....	25	2.9	3.39	30.3	3.7	3.4	7.1
Huntley Project:								
Balantine.....	Vertical turbine-driven centrifugal.....	506	46.3	.....	.....	.1	1.4	1.5
Yakima Project:								
Snipes Mount.....	Vertical turbine-driven centrifugal.....	500	197.0	.....	.....	.6	.6	1.2
Hillcrest.....		35	103.3	.....	.....	.3	1.9	2.2
Yuma:								
Reservation drainage.....	Gas engine-driven centrifugal.....	110	5 to 6	.....	.....	10.6	2.6	13.2
Yuma Valley.....		40	4.0	.....	.....	23.2	1.6	24.8

A method of determining storm-water run-off, C. B. BUERGER (*Trans. Am. Soc. Civ. Engin.*, 78 (1915), pp. 1139-1205, pls. 2, figs. 9).—The author develops a formula for storm-water run-off of the form $q + Nq\% = P$, in which q is the run-off in cubic feet per second per acre and N and P are functions of the variable elements of topography, rainfall, etc. Diagrams are given which afford a ready means of obtaining results from the formula.

Daily river stages at river gauge stations on the principal rivers of the United States, 1915 and 1916, A. J. HENRY (*U. S. Dept. Agr., Weather Bur. Daily River Stages*, 13 (1915), pp. 176; 14 (1916), pp. 278).—These are the thirteenth and fourteenth parts of the series of river gauge readings maintained by the Weather Bureau.

Surface water supply of St. Lawrence River Basin, 1916 (*U. S. Geol. Survey, Water-Supply Paper 434* (1917), pp. 130+XXXII, pls. 5).—This report prepared in cooperation with the States of Minnesota, Wisconsin, New York and Vermont, presents the results of measurements of flow made on streams tributary to Lakes Michigan, Huron, Erie, Ontario, and Superior, and to the St. Lawrence River, during 1916, together with the usual list of gauging stations and publications relating to water resources.

Surface water supply of Hawaii, July 1, 1913, to June 30, 1915, C. K. LARRISON (*U. S. Geol. Survey, Water-Supply Paper 430* (1917), pp. 329).—This report presents the results of measurements of flow made on certain streams

and inches, and records of rainfall and evaporation in the Territory of Hawaii for the biennial period ended June 30, 1915.

The flowing wells of western Queensland, J. W. GREGORY (*Queensland Geogr. Jour.*, n. ser., 30-31 (1916), No. 16-17, pp. 1-29, pl. 1, figs. 4).—The general characteristics of these artesian wells are discussed.

The drainage on the farm, E. R. JONES and O. R. ZEASMAN (*Wisconsin Sta. Bul.* 254 (1917), pp. 32, figs. 22).—This bulletin deals with tile drainage on the individual farm, discussing the benefits of drainage and some of the construction problems, and giving detailed directions for the selection and laying of the drain. Cost estimates and other data are included.

Draining of peat lands by canals, K. H. LUNDEVALL (*Svenska Mosskulturför. Tidskr.* 31 (1917), No. 1, pp. 43-54, figs. 8).—Methods of draining peat lands in Sweden by the use of canals are described and illustrated. The ditches are apparently designed with sufficient velocity to be self-cleaning.

Preliminary report on Kearney Vineyard experimental drain, W. W. WEIR (*Irish. Agr. J.* 32 (1917), No. 10, pp. 151-158, figs. 11).—The substance of this article has been noted from another source (*E. S. R.*, 36, p. 584).

Studies on the culture media employed in the bacteriological examination of water.—IV, Neutral red lactose peptone media, E. M. CHAMOT and C. M. STARKOWICZ (*Jour. Amer. Chem. Soc.*, 39 (1917), No. 8, pp. 1755-1766).—In a fourth report of studies on culture media for the bacteriological examination of water (*E. S. R.*, 34, p. 286) experiments were conducted to ascertain (1) the influence upon the color change of an increased amount of peptone alone instead of the usual 1 or 2 per cent peptone with meat broth or meat extract; (2) the effect of systematic variations of the various components; that is, peptone, lactose solubility, salt, and neutral red, on the sensitiveness of the contrast reaction; (3) the effect of these variations on the volume and composition of the flocs formed; (4) the true nature of the chemical reactions involved in the color change; (5) the value of neutral red medium as an indicator of fecal pollution other than human, in drinking water. The following conclusions were drawn:

"A neutral red medium composed of from 3 to 4 per cent peptone, 0.8 per cent potassium chlorid or potassium sulphate, 0.6 per cent lactose, 0.008 per cent neutral red with a reaction of +1 per cent affords a very sensitive and accurate medium for the speedy detection of fecal pollution by bacteria. The addition of meat broth increases the sensitiveness of the medium but is not essential. The black fluorescent compound formed by the action of the bacteria is probably indol-tryptophan-tryptophan-tryptophan, a simple reduction product of neutral red. Ammonia does not enter into the formation of the reduction product. Pe Stokes neutral red medium is a convenient and reliable one for the detection of fecal contamination in water and is more sensitive than lactose bile."

Seasonal distribution of soil and fecal strains of the colon-aerogenes group in surface waters, MYRTLE GREENFIELD and W. N. SKOURUP (*Jour. Indus. Hyg. Chem.*, 9 (1917), No. 7, pp. 675-678).—Experiments conducted at the Kansas State Board of Health water and sewage laboratory on the variation of the organisms of the colon-aerogenes group in the surface water supplies of Kansas are reported.

It is concluded that "there seems to be no difference between soil and fecal strains of organisms of the colon-aerogenes group from surface water supplies in their resistance to treatment, nor is there a difference between cultures of the four principal groups of MacConkey, isolated from surface water supplies, in their resistance to treatment. There is a correlation between the increase in the fecal strains of organisms of the colon-aerogenes group during dry weather and the sanitary survey."

Disinfection of water by means of bleaching powder, H. LANGER (*Zentr. Hyg. u. Infektionskrank.*, 81 (1916), p. 296; *Chem. Ztg.*, 41 (1917), *Reperi.*, 166; *abs. in Jour. Soc. Chem. Indus.*, 36 (1917), No. 13, p. 733).—A distinction is drawn between disinfection, i. e., rendering bacteria harmless, and the killing of bacteria. In the case of bleaching powder, disinfection is dependent only upon the concentration of the available chlorine, not upon the duration of the exposure. The action is a rapid one and does not consist in oxidation but in absorption of chlorine. The time required to kill the bacteria depends only upon their power of resistance to the injury effected by the chlorine. Disinfection, therefore, is independent of the time elapsing before neutralization of the chlorine. Whether this follows at a longer or shorter interval, the killing of the bacteria is not influenced. The presence of organic matter reduces the concentration of the available chlorine, though the amount of this residue can only be determined by a bacteriological test. The disinfecting action is rendered greater by adding the bleaching powder in fractions, a cumulative effect replacing that of concentration.

The interaction of chlorid of lime with the normal constituents of natural waters and sewage, G. W. HEISE (*Philippine Jour. Sci., Sect. A*, 12 (1917), No. 1, pp. 17-35, figs. 5).—Studies of the rate of decomposition of chlorid of lime in water, sewage, and solutions of organic substances are reported.

It was found that "in the dark, at 28° C., the reactions proceeded with almost constant velocity for periods of 30 minutes to one hour, after which they proceeded very slowly. In the light the decomposition rate was greatly accelerated. In general, the amount of available chlorine consumed is proportional to the concentration in which it is added, as shown by the interaction of chlorid of lime and urea solution. However, for certain definite concentrations of sewage this regularity falls. A study of the reaction between chlorid of lime with varying quantities of urea showed that the chlorine consumed, as measured by the starch-potassium iodid reaction, is not necessarily proportional to the concentration of organic matter. The determination of the chlorine consumption of a water or sewage, though of importance in the control of hypochlorite disinfection, is not sufficient in itself and should be complemented by bacteriological tests."

The construction and operation of concrete septic tanks, H. C. CAMERON (*Dom. Engin.*, 80 (1917), No. 13, pp. 488-490, figs. 2).—Notes are given on residential sewage disposal by means of small septic tanks and the absorbed areas.

Practical road building, C. E. FOOTE (*Philadelphia: David McKay, 1917, 64 pp. XX+11-295, figs. 40*).—This is a popular treatise on the subject for the benefit of the layman, containing chapters on road history, location, grades, drainage, foundations, surfaces, bridges and culverts, traffic and finance, and on earth, gravel, sand, clay, topsoil, macadam, brick, concrete, bituminous, sand asphalt and special surface roads.

Serial bonds for road building save money, M. O. ELDRIDGE (*Engin. News-Rec.*, 79 (1917), No. 9, pp. 467-471, figs. 5).—Tabular and graphic data are reported and discussed from which the conclusion is drawn that on the basis of definite comparisons between the ultimate costs of different types of bonds for road building the serial type is the most desirable. "Especially in local road improvement work, where the sinking funds lead to many troubles, serial bonds are greatly to be preferred. . . ."

"Bond issues ought to be resorted to only where they can not be avoided. It should be a fundamental rule in the financial operations of a county or township that all current expenses, such as for the maintenance of roads, be paid from the proceeds of an annual tax levy. Furthermore, if a township "

county is able to levy a sufficient tax to improve all of the roads required in a reasonable length of time without imposing too great a burden on the taxpayers, it should by all means adopt this course. The only defense that can be offered for a local bond issue rests upon the common sense principles of payment by installment and of capitalizing undeveloped resources. If a system of roads is to be built, it is usually of common advantage that the people who may be called upon to pay the bills should be permitted to distribute their contributions over a period of years and that all who share in the benefits should also share in the burdens."

On January 1, 1915, the total local road and bridge bonds outstanding in the United States, exclusive of cities, amounted to approximately \$230,000,000. It is estimated that at least \$160,000,000 of these bonds were of the sinking-fund variety; that the average term was 25 years; and that the average rate of interest was 5 per cent. If these bonds had been issued as serials, for the same term and bearing the same rate of interest, it would have resulted in a total saving of approximately \$42,000,000, or an average annual saving of \$1,680,000."

Tests of concrete road aggregates, J. P. NASH (*Good Roads*, n. ser., 14 (1917), No. 9, pp. 107-110, 114, fig. 1).—Tests made at the University of Texas to determine the resistance to abrasion and the tensile strength of concrete made from various aggregates are reported. In the tests the chief variable was the coarse aggregate.

It is pointed out that "the two most important essentials for a satisfactory road are (1) uniformity of wear and (2) a minimum of wear. Whenever these two are combined with a high tensile strength the most satisfactory concrete road is found. The conclusions drawn from these tests are as follows:

The uniformity of wear is obtained when the mortar and the coarse aggregate wear equally, such as when crushed limestone or limestone gravel is used. The coarse aggregate should be limited in size to about 1.5 in. When hard, tough stone is used the size should be limited to about 1 in. and the cement content increased. It is questionable if a richer mix than a 1:2:4 is an economical one to use with crushed limestone of the ordinary hardness. Crushed sand when hard and uniform should be satisfactory as a concrete road aggregate. In a 1:2:4 concrete, a gravel composed of very hard stone such as flint or quartz, does not wear uniformly. The action of the cubical shot on the test specimens is a trifle more severe than the traffic on the road. It can be said that either the crushed stone or gravel tested is superior as an aggregate to produce concrete having a higher tensile strength."

An analysis of poppet valve motion, L. T. KNOCKE (*Gas Engine*, 19 (1917), No. 3, pp. 436-440, figs. 6).—This is a mathematical analysis of valve mechanism for gas engines.

A new feed rack for winter feeding, H. O. GARDINER ([*Bien.*] *Rpt. Mont. Game Stock Sanit. Bd.*, 1915-16, pp. 17, 18, pl. 1).—A cattle feeding rack and sheep feeding rack designed for Montana conditions are described and diagrammatically illustrated.

Poultry house equipment, A. G. PHILIPS and L. L. JONES (*Purdue Univ. Rept. Agr. Expt. Bul.* 57 (1917), pp. 12, figs. 9).—Nests, feed hoppers, and watering vessels are described and diagrammatically illustrated.

RURAL ECONOMICS.

The farm-labor problem, D. F. HOUSTON (*Washington, D. C.: U. S. Dept. Agr.* 1917, pp. 4).—This pamphlet calls attention in a general way to the farm-labor problems, and indicates that the most promising solutions are, first, a systematic survey of the farm-labor situation in order to ascertain the possible

needs of the farmers and to determine ways of meeting them; second, the promotion of fuller cooperation in the utilization of labor among farmers in the farm communities; and the further development of machinery in assisting the transfer of labor from one section to another; third, making available labor which has not before been fully or regularly utilized in farming operations; fourth, the replacing of men for agricultural purposes, as far as possible, by woman laborers and by diverting labor from relatively non essential enterprises; fifth, by seeing that all able-bodied men not now doing useful or regular work shall be fully and regularly employed; and, sixth, the largest possible production and the fullest possible use of farm labor-saving machinery.

Farm labor, A. AGEE and F. APP (N. J. Agr. Col. Ext. Bul. 1 (1917), No. 1 pp. 31, figs. 11).—In this bulletin the authors have discussed the reasons for the farm labor shortage, and suggest possible sources of additional workers. They have also discussed methods of boarding and lodging laborers, especially the different kinds of camps that have been used in providing shelter for men and boys in organizations.

The farm-labor problem, W. H. MANSS (Baltimore, Md.: B. & O. R. R. Co. 1917, pp. 10).—This pamphlet discusses the effect of the war upon farming problems, and outlines a scheme for the organization of agricultural armies of boys to undertake farm work during the summer months.

The problem of crop production, J. BRACKEN (Saskatchewan Dept. Agr. Bul. 48 (1917), pp. 24, figs. 12).—The author, in discussing conditions in Saskatchewan, indicates that the elements essential to profitable production of crops are to know the factors that affect the growth of crops, the profitability of production, the permanence of agriculture, and the methods used for their control. The factors affecting growth are considered as good seed, plenty of plant food, and sufficient heat, light, water, and air. The factors affecting production are loss from weeds, insects, rust, hail, and those affecting the cost of production and controlling the selling price. The factors affecting the permanence of agriculture are the method of dealing with the soil, maintaining its health, keeping it free from weed seeds and plant diseases, and maintaining sufficient amounts of available plant food.

State help for agriculture, C. W. TOMKINSON (London: T. Fisher Unwin Ltd., 1917, pp. 189).—Among the suggestions for improving British agriculture are the establishment of an import duty on wheat and other grains, the provision of capital by the State, and a system of administration providing instruction to the individual farmer with reference to the management of his farm.

Corn production act, 1917 (London: Govt., 1917, pp. 11+26).—This pamphlet contains a discussion of the act effective August 21, 1917, for encouraging the production of grain in Great Britain and Ireland. It guarantees a minimum price of wheat and oats, a minimum wage for agricultural workers, places restrictions on the raising of agricultural rent, and extends the powers of the authorities in encouraging cultivation.

The expert agricultural adviser in the region of the Chateau-Gautier, A. BECKERICH (Ann. Sci. Agron., 4. ser., 5 (1916), No. 7-9, pp. 371-392).—The author discusses the work and value of such an advisor, indicating the kind of farming to be followed, the types of farm operations, and his value to the agriculture of the community.

County boards of agriculture and list of granges (N. J. Dept. Agr. Bul. 8 (1917), pp. 62).—This report gives a brief statement of the activities of the county board of agriculture, together with the principal officers in the various granges in the State.

South Dakota system of rural credits [1917] (*Pierre, S. Dak.: Rural Credit* [1917], pp. 8).—This pamphlet contains information for prospective borrowers upon farm land as to the workings of the rural credit act of that State.

The cooperative movement among farmers in the United States, LOUISE MAXIMIAN (*Syracuse, N. Y.: Syracuse Univ., 1917, pp. 35*).—This is a bibliography relating to agricultural cooperation, and the author has classified the books as those general in nature and those that relate to the commercial, educational, political, and social phases. Both books and magazines are included in the list.

The operations of the national cooperative organization during the war (*Rapporto della durata il Periodo della Guerra. Monza, Italy: Lega Naz. Coop., 1916, pp. 36*).—This report discusses the duties of the general secretary of this body, the functions of the central office at Rome, and the activities of the society in such matters as carrying on propaganda and meeting the war situation with reference to food and labor, and gives data regarding the growth of the organization during 1915.

Cooperative marketing, W. W. CUMBERLAND (*Princeton, N. J.: Princeton Univ. Press, 1917, pp. VIII+226*).—This publication describes the methods and organizations connected with the marketing of California citrus fruit products.

Marketing survey of New Haven, L. D. H. WELD (*New Haven, Conn.: Yale Univ., 1917, pp. 52, figs. 4*).—In this report have been discussed the various methods of distributing products in New Haven, with the recommendation that the various organizations concentrate on the establishment of a well-organized farmers' wholesale market. For the present it advocates the use of the markets now in use, but in the future there should be established an open market place with assignments to individual farmers at a small rental per day or per season, and a marketmaster chosen, regulations prescribed, and the necessary city ordinance drawn up and passed without delay. It considers that the retail farmers' market, retail dealers' market, and the wholesale dealers' market are not essential under present conditions.

The wheat situation, present and prospective, T. K. DOHERTY (*Agr. Gaz. Canada, 5 (1918), No. 1, pp. 109-112*).—The author has discussed the wheat situation by comparing data for 1916 and 1917 with the five years 1907-1913, grouping his data as South Mediterranean and the Cape, neutral countries open to the world's commerce, importing allied countries open to the world's commerce, and exporting countries open to the world's commerce.

The restrictions of consumption of grain products in European countries, F. PAVEN (*Écon. Franç., 45 (1917), 11, No. 49, pp. 725-727*).—This paper indicates the articles restricted, variations in different countries, and methods used.

Conditions in the sugar market, January-October, 1917 (*New York: American Sugar Refining Co., [1917], pp. 78, pl. 1, figs. 7*).—In this report are discussed the world's sugar supply, the effect of the war upon the supply, and market conditions during the first half of 1917. It also contains statements with reference to the consumption in the United States and arrangements with the Food Administration with reference to facilitating distribution.

Live stock statistics (*Internat. Inst. Agr. Rome, Internat. Crop Rpt. and Agr. Statist., 8 (1917), No. 11, pp. 878, 879*).—These pages contain data as to the number of horses in Scotland in 1917, the 47 governments in European Russia in 1916, and for New Zealand in 1917, with comparative data for earlier years.

Reply of Swift & Company to questions submitted July 23, 1917, by the Federal Trade Commission (*Chicago, 1917, pp. 33, pls. 3*).—This report discusses prices of live stock, meat, and meat products, the demand for and supply of meat, the services performed for middlemen in the meat trade, the functions

of the packing-house system, and the weaknesses in existing methods of production and marketing of live stock.

Monthly crop report (*U. S. Dept. Agr. Mo. Crop Rpt.*, 3 (1917), No. 12, pp. 117-136, fig. 1).—This number contains data showing the final estimate of the 1917 acreage, average yield and production, price, total farm value, and value per acre for the principal farm crops. It also contains data with reference to production of tobacco by types and districts, and the monthly prices for a series of years for principal farm crops, together with estimated farm value of important crops November 15, as well as average prices received by producers and range of prices of agricultural products at important markets. There are special reports regarding winter and spring truck crops, sugar beets and sugar for 1917, a December estimate of the cotton crop, crop statistics by States for 1915-1917, winter wheat acreage, clover seed production, sugar beet seeds, estimated production of hay in 1916-17 by kinds, aggregate crop value for 1917 with comparisons with earlier years, percentage of total corn crop consisting of white, yellow, and mixed corn, acreage of winter wheat and corn sown in 1917, etc.

[**Agricultural statistics of Canada**] (*Canada Yearbook*, 1916-17, pp. 176-249, pl. 1, fig. 1).—Among the data included in these pages are those relating to weather conditions, production, foreign and domestic trade in agricultural products, manufacturing of agricultural products, prices, and public lands.

Census of Manitoba, 1916 (*Census and Statistics Canada Bul.*, [1917], pp. 16-17).—This report contains data regarding urban and rural population, the number of farms and the distribution of the land among the different agricultural purposes, area sown to various crops, production and value, and number of live stock of different classes for 1916.

[**Agricultural statistics of Argentina**] (*Argentine Year Book*, 10 (1915-16), pp. 210-252).—These pages contain data for 1914 with reference to the area cultivated and the area under specific crops, trade in agricultural products, agricultural cooperative organizations, live stock, rural holdings, public lands, and industries allied to agriculture.

Agriculture in Switzerland during the crop year 1915 (*Ann. Agr. Suisse*, 18 (1917), No. 2, pp. 30-49).—This report discusses weather conditions, damage to crops, extent of the harvest and the milk production, diseases affecting live stock, export and import trade, prices, and interest rates.

Agricultural income in Switzerland, 1915-16 (*Ann. Agr. Suisse*, 18 (1917), No. 2, pp. 50-205).—These pages contain data for the crop year 1915-16 showing the incomes of various agricultural exploitations and also giving data regarding the persons employed, crops obtained, wages, and interest.

Area, classification of area, area under crops, live stock, land revenue assessment, and transfers of land in certain native States, G. F. SUTCLIFF (*Agr. Statis. India*, 31 (1914-15), II, pp. V+116).—This report continues information previously noted (*E. S. R.*, 36, p. 291) by adding information for another season.

AGRICULTURAL EDUCATION.

Annual report of the Federal Board for Vocational Education, 1917 (*Rpt. Fed. Bd. Vocational Ed.*, 1917, pp. 32).—This is the first annual report of this board under the act previously noted (*E. S. R.*, 36, p. 701).

The board has in progress studies and investigations of vocational problems in connection with the military departments of the Government; vocational rehabilitation of crippled soldiers and sailors; training teachers, supervisors and directors of agriculture; plant and equipment for agricultural schools; the

organization of secondary schools in agriculture, including courses of study and supervision; materials and methods in secondary school agriculture; supervised practical work in agriculture, including the home project method of instruction; teacher training for trades and industries; home economics education as vocational education in schools and classes receiving Federal aid; teacher training for the teaching of home economics subjects; suggestive courses of study and content of courses in home economics; etc.

The report also includes a statement of the response of the States to the act regarding the designation of State boards to cooperate with the Federal board, appropriations for vocational education, etc., and a tabular statement of the allotment of the Federal funds to the States for the fiscal year 1918. The act has been accepted by all States except North Dakota and Rhode Island. In 29 States the State board of education was designated as the cooperating board; in New York and West Virginia the board of regents was designated; in Colorado the State board of agriculture, in Minnesota the State high-school board, in Wisconsin the State board of industrial education; while in Alabama, Georgia, Illinois, Iowa, Maine, Michigan, Mississippi, Nebraska, New Hampshire, North Carolina, Oklahoma, and Oregon, new boards for vocational education were created. There are no records of acceptance of the act by North Dakota and Rhode Island.

The total allotment to the States is \$1,655,586.72, of which \$547,027.79 is for salaries of teachers, supervisors, and directors of agriculture, \$564,444.80 for salaries of teachers of trade, home economics, and industries, and \$544,114.14 for salaries of teachers and maintenance of teacher training. Of the States New York received the largest appropriation, namely \$154,210.39, of which \$49,535.60 is for agriculture, \$84,950.35 for trade, home economics, and industry, and \$49,724.44 for teacher training. Thirteen States received the minimum of \$15,000.00 each. The largest allotment for agriculture made to a single State was \$30,744.79 to Pennsylvania, while 16 States received \$5,000 each, the minimum allotment.

*Statement of policies (Fed. Bd. Vocational Ed. Bul. 1 (1917), pp. 70, fig. 1).—*This bulletin presents a preliminary and tentative summary of the policies thus far adopted by the Federal Board for Vocational Education for administering the Smith-Hughes Act. Part 1 includes general policies or standards, and Part 2, principally rulings upon and a discussion of points raised at the hearings given to the State boards for vocational education. Two appendixes follow the text of the act; an analysis of the legal requirements imposed upon the States, the Federal board, the Secretary of the Treasury, the custodian of vocational education, etc.; and statistical tables showing the total annual expenditures by the Federal Government under the act for vocational education in agriculture, trade, home economics and industries, and for teacher training for the fiscal year 1918.

*Federal aid for vocational agriculture in Texas under the Smith-Hughes Act (Dep. Ed. Tex. Bul. 68 (1917), pp. 14).—*This bulletin outlines the conditions governing Federal aid for vocational agriculture in Texas under the provisions of the Smith-Hughes Act, including a statement of the approximate appropriations available during the next 10 years.

Under the plan announced, Federal aid may be given to vocational agricultural departments in high schools classified by the State department of education, special vocational agricultural schools, and part-time or evening classes for vocational agriculture. The community board of control of vocational agricultural departments in classified high schools must provide a \$200 equipment as a minimum and such additional equipment as may be required by the State board for vocational education, and lease or purchase suitable

land of at least one acre and sufficient to provide 0.1 acre for each person enrolling for plant production projects. The community boards of control of agricultural schools of agriculture must provide a \$500 minimum equipment, 10 acres of suitable land, the necessary buildings, and such additional equipment as the State board may require. The teachers of vocational agriculture must be employed on a 12 months' basis at a minimum salary of \$1,200. Federal funds may be used for only that portion of a teacher's time devoted to vocational agriculture.

The courses of study for vocational agricultural schools and departments must consist of 4 years' work, 50 per cent of which time each year must be devoted to instruction in agriculture, demonstrations, supervised agricultural projects, and supervised study in agriculture and project work, and the remaining time to such subjects as will give additional cultural and good citizenship training. Each student must do six months' supervised project work each year, and each project must be visited by the supervisor in charge at least once each month.

The qualifications of all teachers, supervisors, or directors of vocational agriculture include graduation from a standard agricultural college, or its equivalent, at least two years of actual working experience on a farm after the twelfth birthday, one full year's course in education or its equivalent, one-half year of agricultural teaching experience in a secondary school or its equivalent, etc. After July 1, 1921, these qualifications will include the completion of a 4-year college course in vocational agricultural education with 144 semester hours' work, at least 40 hours of which must be technical agriculture and from 15 to 24 hours professional training, including supervised practice teaching in secondary agriculture. Upon the completion of the course a permanent teacher's certificate will be granted by the State department of education. The admission requirements to this course will be 14 units of high-school work.

A possible core for a program in agricultural education, T. H. Egan (*School and Soc.*, 6 (1917), No. 157, pp. 755-761).—The author defines agriculture in its narrowest, modern technical, and broadest sense, stating the prerequisites to success in each. In his opinion agricultural education may mean apprenticeship in the processes of husbandry, scientific instruction in the technology of production from the land, or preparation for intelligent entering upon the life of a farmer. These three aspects are prevocational, vocational, and liberalizing. To serve as a guide to those activities which must be participated in by learners fitting themselves for the life of a farmer, he submits a crude classification of certain activities that seem to him common to the lives of American farmers, followed by suggestive possible activities of the learner in two or more of three categories, viz., primary activities for the acquirement of first-hand meanings and a greater or less degree of skill, secondary activities for organized knowledge and adaptability to varying situations, and tertiary studies for the sake of insight and appreciation.

Sixteenth annual general report of the Department of Agriculture and Technical Instruction for Ireland, 1915-16 (*Dept. Agr. and Tech. Inst. Ireland, Ann. Gen. Rpt.*, 16 (1915-16), pp. VI+201).—This is the usual annual report on the department's administration and funds, with details of operations during the year 1915-16, including agricultural and technical instruction.

Soil physics and management, J. G. MOSIER and A. F. GUSTAFSON (*Pennsylvania and London: J. B. Lippincott Co., 1917, pp. XIII+442, pl. 1, figs. 282*).—This book, which has been written as a textbook for the agricultural student, a reference book for the practical farmer, and an aid to the land owner desiring information in the personal management of his land, emphasizes the pro-

of soil physics and omits the details of practice except where necessary for purposes of illustration. It treats of soil material and its origin and development, weathering, classification of soils, constituents, physical properties, control of moisture and irrigation, alkali lands and their reclamation, temperature, soil air and soil aeration, soil organisms, tillage, erosion, and rotation. Each chapter is followed by review questions and references to literature. The appendices deal respectively with soil fertility including some of the underlying principles, data with reference to the average yields of crops, the value of farm land and property, and crop acreage production, by means of

maps.

Home economics in the Detroit schools, CHARLOTTE KEEN (*Jour. Home Econ.*, 1916, No. 9, pp. 479-487).—This is an account of the present status of home economics instruction in the elementary, secondary, junior high, and high schools of Detroit, Mich.

The first classes in home economics in the Detroit public schools were formed in October 4, 1899. Instruction is now compulsory in the grades, the junior high schools, and in one year of the high schools.

Instruction in hand sewing is given in the fourth and fifth grades and in dressmaking in the eighth grade. Domestic science is taught in the sixth and seventh grades. The aim of the domestic science work in the grades is to teach dexterity in the handling of utensils and the manipulation of food by simple experiments with carbon dioxide, water, starch, albumin, gluten, egg powder, and yeast are performed. About one-half of the kitchens are individual equipments and in the others the group-of-two method is employed. The equipment is for 24 or 32 pupils, and special effort is made to make the work as much like home processes as possible. In most of the grade the period of 90 minutes a week is given to domestic science, but in the two or more 90-minute periods are devoted in the grades to this work.

In the secondary schools the various textiles in relation to production, manufacture, and cost are studied, and taste and judgment are developed in the selection and use of materials. Sufficient constructive skill is cultivated to enable the student to make her own clothes. Sewing is usually given four times a week with two hours' credit. The course in domestic science includes instruction in infant and invalid diet, household management, the food budget, the cost and purchasing of food, housewifery and laundering. Credit of either sewing or cooking is required for credit.

Suggested plans for the serving of lunches in centralized schools of Ohio, PAUL KAUFMAN (*Agr. Col. Ext. Bul. [Ohio State Univ.], 13 (1917-18), No. 13, fig. 5*).—The work suggested is intended to be a part of the regular home economics course in the school with full credit and laboratory time. The plan includes the assignment of committees for each of the various processes. Receipts and lists of equipment and supplies, foods grouped according to predominant food nutrient to facilitate having a well balanced meal, the cost of lunches, and references to the literature are given; also suggestions for general management, making calculations, reducing costs, and keeping accounts when either a complete or supplementary lunch is served.

Schoolboys on farms: A war time experiment, W. I. HAMILTON (*Amer. Ed. Jour.*, 56 (1918), No. 1, pp. 21-23, 76-78).—The author discusses the methods of mobilization of schoolboys for farm work in Massachusetts, cooperation, office administration, camps, sites and equipment, camp management, evaluation of the movement, and plans for the future.

NOTES.

Purdue University.—G. I. Christie, superintendent of agricultural extension, has been granted leave of absence to become assistant to the Secretary of Agriculture, in charge of this Department's activities in remedying farm-lease problems. T. A. Coleman, State leader of county agents, will serve as extension director during his absence.

Massachusetts Station.—Dr. W. P. Brooks has been granted leave of absence as director, on account of ill health, until September 1, and F. W. Morse has been appointed acting director. James P. Buckley, Jr., and B. L. Peabody have resigned as assistant chemists, and Harold B. Pierce has been appointed assistant chemist.

Minnesota University and Station.—Francis Jager, chief of the bee division, and C. P. Bull, professor of agronomy, have been granted leave of absence on an agricultural mission to Serbia for the American National Red Cross. A tract of about 30,000 acres of rich and practically virgin soil near Monastir is to be put into cultivation by the use of modern equipment and improved seed shipped from this country. It is hoped to relieve materially the food shortage in the region by this enterprise.

A. H. Benton, assistant professor of farm management, has accepted a position as professor and chief of the division of farm management and rural economics at the Manitoba Agricultural College, beginning August 1. Dr. C. B. Lord, of the veterinary division, has received an appointment to the Bureau of Animal Industry of the U. S. Department of Agriculture. Mrs. Stella Palmer, assistant professor of foods and cookery, has been appointed chief of the division of home economics at the University of Arkansas, beginning August 1.

Science announces the retirement of T. L. Haecker at the close of the current year, July 31. R. J. Garber has been appointed assistant in plant breeding at the station.

Montana College and Station.—The contract has been let for a new chemistry building to replace that burned in October, 1916. A 3-story structure 110 ft. by 68 ft. is planned, with provision for a subsequent extension to a frontage of 160 ft. The cost is to be \$107,000 exclusive of furnishings. The college and station work in chemistry will be housed in the new building.

A tract of nearly 20 acres has been added to the college campus, making a total of over 100 acres. A permanent plan for the future development of the buildings and grounds has just been completed.

Nebraska University and Station.—L. W. Chase, professor of agricultural engineering, has been appointed major in the Ordnance Corps, U. S. Army. C. W. Smith, county agent of Seward County, and C. D. Kinsman, experienced assistant in rural engineering at Purdue University, have been appointed associate professors in agricultural engineering. H. B. Pier has resigned as assistant professor of animal husbandry. John A. Luthley has been appointed assistant professor in dairy husbandry.

Oklahoma Station.—Dr. John E. Guberlet has been appointed parasitologist, effective July 1.

South Dakota College and Station.—Christian Larsen, head of the dairy husbandry department, has been appointed director of extension, vice George W. Randlett resigned.

